Managing Devices

LESSON 5

EXAM OBJECTIVE MATRIX

Skills/Concepts	Exam Objective Description	Exam Objective Number
Understanding Storage	Understand storage.	5.2
Understanding Printing Devices	Connect devices. Understand printing devices.	5.1 5.3
Understanding System Devices	Connect devices. Understand system devices.	5.1 5.4

KEY TERMS

audio device
basic disk
cloud storage
Computer Management
Device Manager
Disk Management
driver
dual-boot environment
dynamic disk
External Serial Advanced Technology Attachment (eSATA)
fill and spill
FireWire
IEEE 1394
input device
infrared technology
Internet Small Computer System Interface (iSCSI)
isochronous data transfer
local printer
mirrored volume
network printer
partition
plug-and-play (PnP) technology
print queue
spanned volume
striped volume
universal serial bus (USB)
video device
volume
Windows Live Mesh
Windows Live SkyDrive

Some of the computers you support at Interstate Snacks have two or more disks. To make the most of the storage space, you plan to span, stripe, or mirror the volumes, depending on the needs of each user. You also plan to run a pilot project using cloud storage and services such as Windows Live SkyDrive, Windows Live Mesh, and OneNote to SkyDrive.

Understanding Storage

THE BOTTOM LINE

Storage in Windows 7 refers to storing data as well as an operating system on disks. There are a number of different types of storage: internal, external, network, and cloud.

When it comes to Windows storage, there's more to it than just saving data on a disk. There are different types of disks (basic and dynamic) you need to know about, along with choices of partition styles such as master boot record (MBR) and GUID partition table (GPT), which determine the number of partitions you are allowed to create along with the size limitations of those partitions.

Understanding Disk and Drive Types

Windows 7 supports two primary types of disks: basic and dynamic. In addition, the operating system supports simple, spanned, striped, and mirrored volumes. Use the Disk Management tool in the Computer Management snap-in to manage disks, partitions, and volumes.

CERTIFICATION READY
What are common types of drives supported by Windows 7?
5.2

In Windows 7, a physical hard drive can be designated as a basic disk or a dynamic disk. ***Basic disks*** contain only simple volumes. ***Dynamic disks*** can contain simple, spanned, striped, and mirrored volumes.

Traditionally, basic disks use ***partitions*** and logical drives. The MBR partition style has been around for quite a while and all Windows operating systems support MBR partitions. But as with most legacy technologies, MBR partitions have their limitations. MBR partitions are limited to four basic partitions and each partition is limited to 2 terabytes (TB) in size. The four basic partitions can be either four primary partitions or three primary partitions with one extended partition, which can be further divided into multiple logical partitions.

TAKE NOTE*
One zeta byte is equal to one billion terabytes.

A GPT partition style allows for more partitions and larger volume sizes. A disk initialized as a GPT partition style may contain up to 128 primary partitions and each can be larger than 2 TB; in fact, they can be as large as 9.4 zetabytes (ZB).

With dynamic disks, free space on a hard drive is divided into ***volumes*** instead of partitions. Dynamic disks are not limited by partition styles as are basic disks. You can configure dynamic disk volumes as simple, spanned, mirrored, striped, or RAID-5:

- **Simple volume:** This type of volume uses free space available on a single disk.
- **Spanned volume:** This type of volume extends a simple volume across multiple disks, up to a maximum of 32.
- **Mirrored volume:** This type of volume duplicates data from one disk to a second disk for redundancy and fault tolerance; if one disk fails, data can be accessed from the second

disk. You cannot span a mirrored volume; a mirrored volume must reside on a single disk. Mirroring is also referred to as RAID-1.

- **Striped volume:** This type of volume stores data across two or more physical disks. Data on a striped volume is written evenly to each of the physical disks in the volume. You cannot mirror or span a striped volume. Striping is often referred to as RAID-0.
- **RAID-5 volume:** This type of volume is a type of striped volume that also provides fault tolerance. Data is written to three or more disks; if one disk fails, the remaining drives re-create the data.

You can typically convert a basic disk to a dynamic disk without losing any data, but it's a best practice to back up all data before attempting the conversion. You might need to convert a hard disk from dynamic to basic at some point. For example, a user's computer runs Windows 7 and the single hard disk is configured as a dynamic disk. However, he needs access to both Windows 7 and Windows XP on the same computer. This is called a ***dual-boot environment***. When the user starts the computer, he can choose one or the other operating system to run. Because Windows XP does not support dynamic disks, you would need to convert the hard disk from dynamic to basic. This conversion requires you to delete all volumes first, which deletes the data, so you must back up the data before you begin the conversion.

CERTIFICATION READY
What types of disks and file systems does Windows 7 support?
5.2

Recall from Lesson 4 that the three primary types of file systems for Windows are FAT, FAT32, and NTFS. It's best to use NTFS-formatted disks for Windows 7 because NTFS handles small to very large hard disks, provides better security, and is the most reliable. Both basic and dynamic disks can contain any combination of FAT, FAT32, and NTFS partitions or volumes.

Using Disk Management

When you add a new hard drive to a computer, there a few steps you need to take to introduce a new drive to the operating system. You need to initialize the disk, and then choose a drive type and a partition style (for basic disks). You can perform all of these steps in the Disk Management tool, which is part of the ***Computer Management*** MMC snap-in.

To open Computer Management, click Start, type computer in the Search programs and files search box, and then select Computer Management from the resulting list. Alternately, you can use the menus: Click Start, right-click Computer, and then click Manage. Figure 5-1 shows the tools in the Computer Management snap-in. The tool you use to work with disks is the ***Disk Management*** tool.

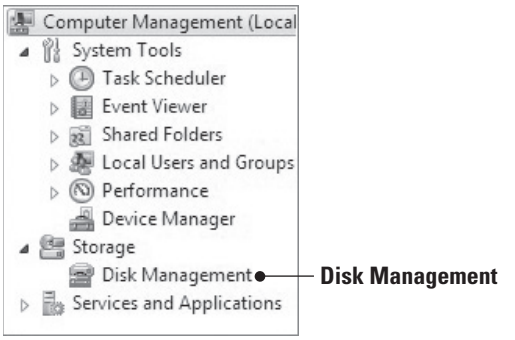
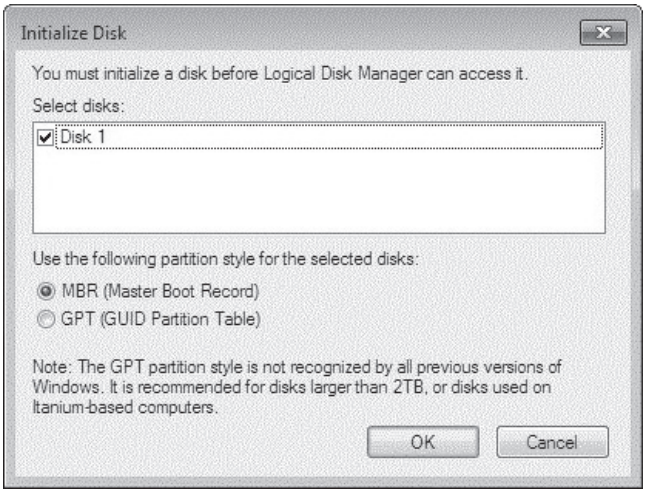


Figure 5-1
The Computer Management snap-in

Click the Disk Management node. If you just installed a new hard disk, Disk Manager prompts you to initialize the new disk by displaying the Initialize Disk dialog box (Figure 5-2).

Figure 5-2

The Initialize Disk dialog box



The first choice you need to make is the partition style of the disk. You need to be sure you select the correct partition style because this is not something easily changed later. The two partition styles are master boot record (MBR) and GUID partition table (GPT).

You can change your partition style as long as you have not created any partitions. If you have created partitions that contain data and wish to change the partition style, you need to back up your data, delete all partitions, and then right-click the disk number and choose to convert to the new partition style.

Next you need to choose the type of disk: basic or dynamic. Basic disks contain only simple volumes. The partition style you choose dictates the number of partitions you can create and their sizes. Dynamic disks can contain simple, spanned, striped, and mirrored volumes.

CONVERT A DISK FROM BASIC TO DYNAMIC

GET READY. To convert a disk from basic to dynamic, perform the following steps:

1. Back up all data on the disk you want to convert.
2. Open Disk Management in the Computer Management console.
3. Right-click the basic disk you want to convert and select **Convert to Dynamic Disk**.
4. If the disk is currently MBR, the Convert to GPT Disk option displays on the menu. If the disk is GPT, the Convert to MBR Disk option displays. Select the appropriate option.

After you convert the partition style, you can create partitions again and restore the data that you previously backed up.

TAKE NOTE*

The conversion from basic to dynamic can occur automatically based on the type of volume you create. You'll see this in action in the step-by-step exercise named "Create a Spanned Volume."

In the next example, a second disk is added to the computer, so two disks have been initialized as MBR. However, you will create a simple volume on only one of the dynamic disks. Spanning, striping, and mirroring, which you will do in subsequent step-by-step exercises, involve two or more disks.

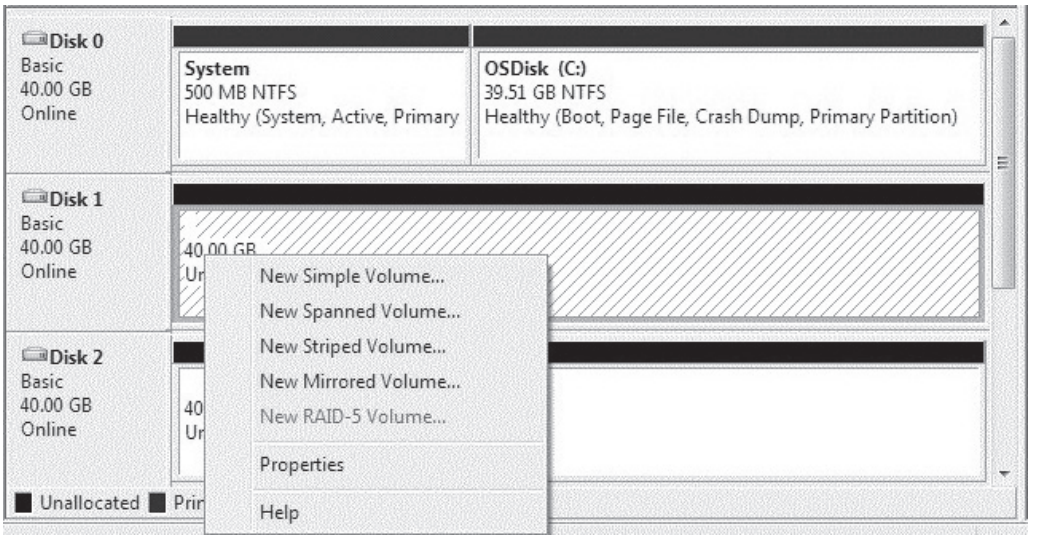
CREATE A SIMPLE VOLUME

GET READY. To create a simple volume, perform the following steps:

1. Open Disk Management from the Computer Management console. (Click **Start**, type **computer** in the **Search programs and files** search box, select **Computer Management** from the resulting list, and then click the **Disk Management** node.)
2. Right-click an empty area (unallocated space) of a dynamic disk. The New Volume menu displays, similar to Figure 5-3. Click **New Simple Volume**.

Figure 5-3

The New Volume menu



3. The New Simple Volume Wizard starts. Click **Next** on the welcome screen.
4. On the Assign Drive Letter or Path screen, specify your volume size, assign a drive letter or path, and choose a file system such as FAT, FAT32, or NTFS.
5. On the Format Partition screen, you may choose an allocation unit size and a name for the volume label. (If you're not familiar with allocation unit sizes, accept the default.) There are also two options you can set: **Perform a quick format** (selected by default, which is a good idea) and **Enable file and folder compression**, which is not selected by default.
6. On the Completing the New Simple Volume Wizard screen, click **Finish**.

XREF

Compression was covered in Lesson 4.

You will now have a new partition on the dynamic disk where you can store data. All the other volume types—spanned, striped, and mirrored—require two or more disks. Therefore, if you have only one disk, the options to create spanned volumes, striped volumes, or mirrored volumes are grayed out and thus cannot be selected.

Spanned Volumes

If you have an additional disk with unused space, you can create a ***spanned volume***. Spanned volumes include two or more disks (up to 32 may be included) that are represented in Windows Explorer as a single drive letter. They are sometimes referred to as ***fill and spill*** because all storage space on the first disk must be filled before data is stored on the second and subsequent disks.

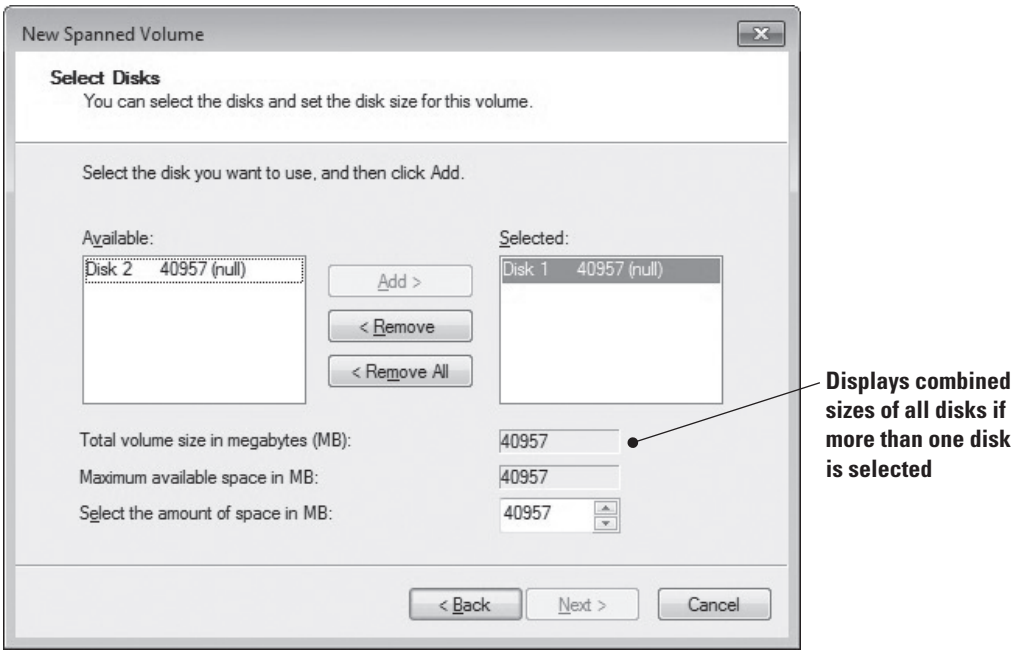
CREATE A SPANNED VOLUME

GET READY. To create a spanned volume, perform the following steps:

1. Open Disk Management from the Computer Management console. (Click **Start**, type **computer** in the **Search programs and files** search box, select **Computer Management** from the resulting list, and then click the **Disk Management** node.)
2. Right-click an empty area of a dynamic disk and then click **New Spanned Volume**.
3. Click **Next** on the Welcome to the New Spanned Volume Wizard screen.
4. Highlight the desired disk in the Available box, shown in Figure 5-4. Click **Add**. (You can also double-click the available disk to add it to the selected box).

Figure 5-4

The Select Disks page

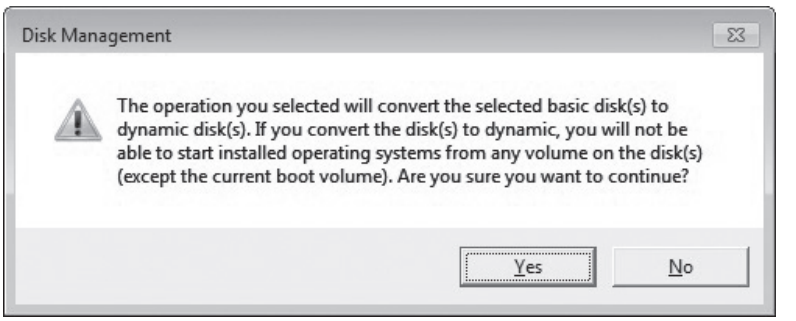


5. When you add disks to the **Selected** box, the **Total volume size in megabytes (MB)** box displays the combined sizes of all disks, yet when you highlight one of the disks in the **Selected** box, the **Maximum available space in MB** box and **Select the amount of space in MB** box show what you have selected from that specific disk. You can select different amount of space from each disk you add. You can continue to add as many disks as you would like included in your spanned volume. When you have selected the disks, click **Next**.
6. On the Assign Drive Letter or Path screen, select a drive letter and click **Next**.
7. The Format Volume screen is the same as creating a simple volume. Set your format volume options and click **Next**.
8. Click **Finish** on the Completing the New Spanned Volume Wizard page.

9. A warning message displays (see Figure 5-5), letting you know that in order to create a spanned volume, the basic disk will be converted to a dynamic disk. If you convert the disk to dynamic, you will not be able to start installed operating systems from any volume on the disk. Click **Yes** to continue or **No** to cancel the operation.

Figure 5-5

The convert basic disk to dynamic disk warning message



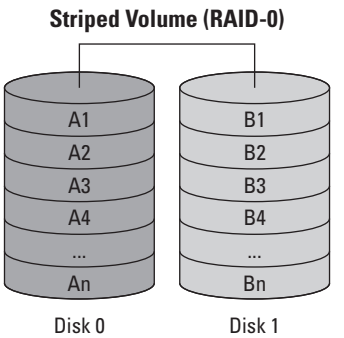
Do not plan to use spanned volumes for fault tolerance. If one disk in the spanned volume fails, all data in the spanned volume is lost unless you have a backup.

Striped Volumes

Creating a ***striped volume*** is similar to creating a spanned volume in that almost all the steps are the same. However, the way data is stored on a striped volume is different than a spanned volume. As with a spanned volume, striped volumes must contain at least two disks and can contain up to 32. But when the data is stored, it is separated into 64 kilobyte (KB) chunks. The first 64 KB is stored on Disk 1 in the striped volume, the second 64 KB chunk is stored on Disk 2, and so on. (See Figure 5-6.) The data is literally striped across multiple drives.

Figure 5-6

A striped volume



Accessing data on a striped volume is faster than accessing data on a spanned volume because a striped volume has multiple sets of read/write heads working simultaneously when reading and writing data. In this regard, spanned volumes are good for high capacity, whereas striped volumes are better for performance.

CREATE A STRIPED VOLUME

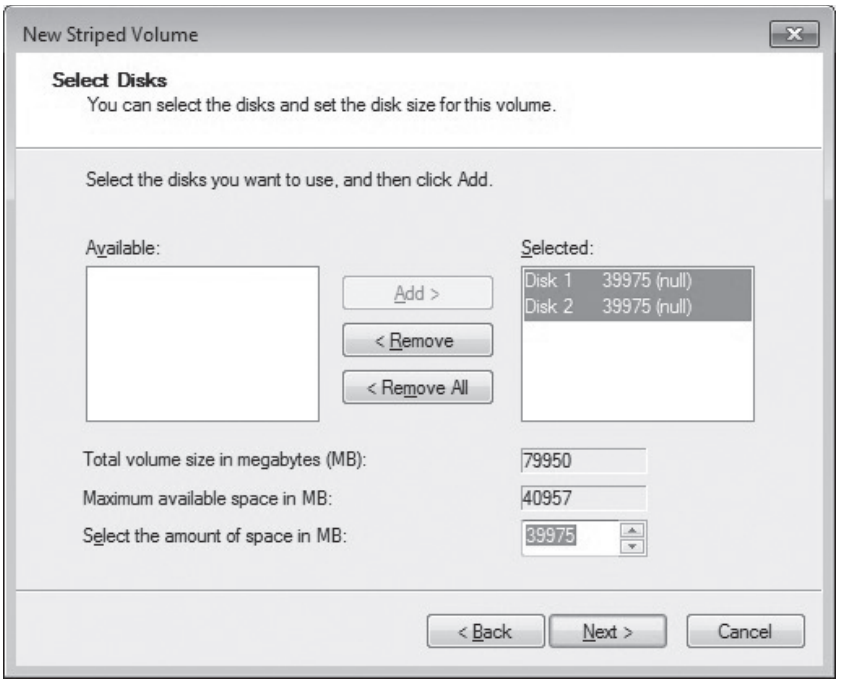
GET READY. To create a striped volume, perform the following steps:

1. In Disk Management, right-click an empty disk and choose **New Striped Volume**. Click **Next** on the Welcome to the New Striped Volume Wizard screen.
2. Highlight the second disk from the **Available** box (same dialog box as Figure 5-4) and then click **Add**.

When you add disks to the **Selected** box, the **Total volume size in megabytes (MB)** box displays the combined sizes of all disks. This is where one of the big differences between spanned volumes and striped volumes takes place: On spanned volumes you can take different amounts of hard drive space from each disk—you cannot do this with striped volumes. Striped volumes must use the same amount of disk space from each disk you take to the striped volume. Therefore after you add two or more disks to the Selected box, if you change the **Select the amount of space in MB** setting (regardless of which disk is highlighted in the **Selected** box), the size difference will be reflected on both (or all) disks that you had added, as shown in Figure 5-7. Both disks have 40957 MB of space but we have changed the **Select the amount of space in MB** value to 39975.

Figure 5-7

Selecting disks for a striped volume



3. When you have selected the disks, click **Next**.
4. On the Assign Drive Letter or Path screen, select your drive letter and then click **Next**. The Format Volume screen displays. Set your format volume options and then click **Next**. Click **Finish**.
5. The same warning message from Figure 5-5 displays: To create a striped volume, the basic disk will be converted to a dynamic disk. If you convert the disk to dynamic, you will not be able to start installed operating systems from any volume on the disk. Click **Yes** to continue or **No** to cancel.

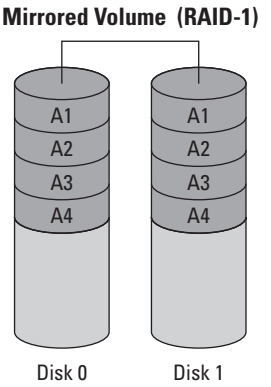
Striped volumes do not offer fault tolerance. Just as with spanned volumes, if one disk in the striped volume fails, all data from the entire striped volume is lost. You'll have to retrieve the data from a previous backup.

Mirrored Volumes

Mirrored volumes require only two disks. You cannot mirror to a third or fourth disk. Mirrored volumes store an exact copy of data from the first member of the mirrored volume to the second member. Because the data is written across both drives, you do get fault tolerance with mirrored volumes. Figure 5-8 shows an example of a mirrored volume.

Figure 5-8

A mirrored volume



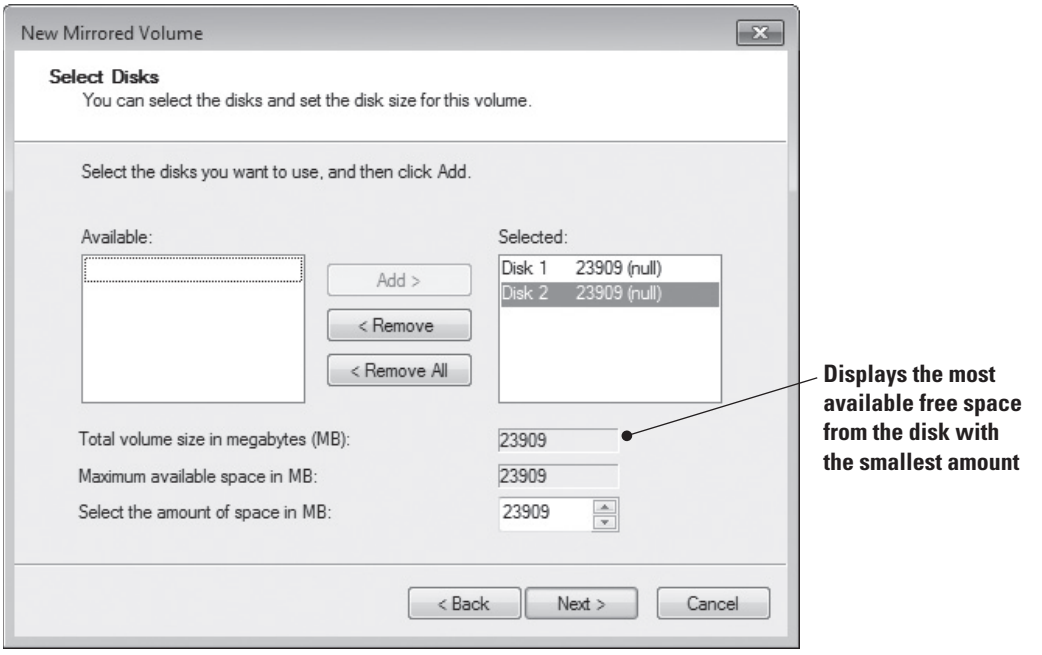
CREATE A MIRRORED VOLUME

GET READY. To create a mirrored volume, perform the following steps:

1. In Disk Management, right-click an empty disk and then click **New Mirrored Volume**. Click **Next** on the Welcome to the New Mirrored Volume Wizard screen.
2. Highlight the second disk from the **Available** box. Mirrored volumes require the same amount of disk space from each disk. When you add a disk to the **Selected** box, the **Total volume size in megabytes (MB)** box displays the most available free space from the disk with the smallest amount (see Figure 5-9).

Figure 5-9

Adding disks to a mirrored volume



Notice that Disk 1 has 24.35 GB available and Disk 2 has only 23.35. On the Select Disks screen, the most that can be added is 23909 because that's the amount of available space from Disk 2. You can reduce the amount of space, but it will be reduced on both disks. This makes sense because you're creating an exact copy of data stored on the source disk, so you don't need the destination disk to have additional free space that will never be used. When you have selected the disks, click **Next**.

3. On the Assign Drive Letter or Path screen, select a drive letter and then click **Next**. The Format Volume screen is the same as the previous Format Volume screens. Set your format volume options and then click **Next**. Click **Finish**.

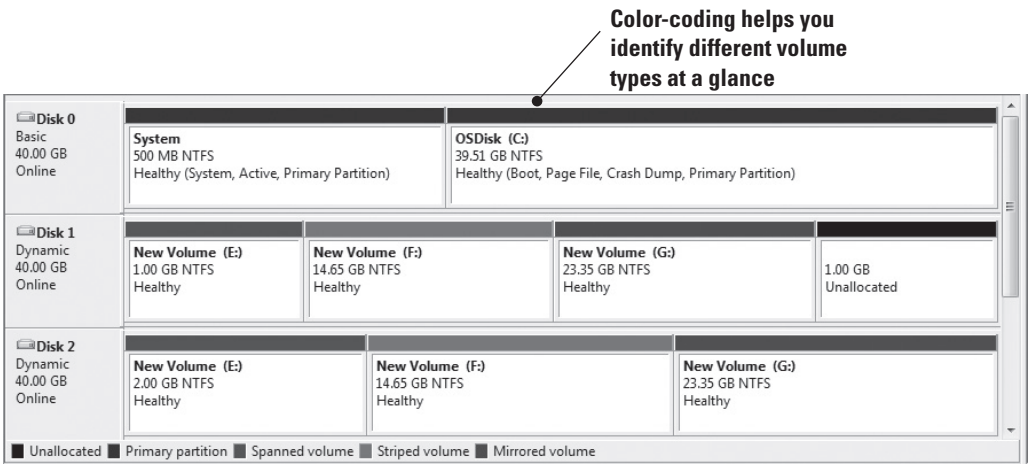
4. A warning message displays (see Figure 5-5), informing you that the basic disk will be converted to a dynamic disk. If you convert the disk to dynamic, you will not be able to start installed operating systems from any volume on the disk. Click **Yes**.

After you create a few different types of volumes, it's easy to figure out which volume is which—they're identified by a strip of color at the top of the volume. Figure 5-10 shows the default legend colors for the different types of volumes:

- Simple volumes (volume C) are identified by their dark blue strips
- Spanned volumes display purple strips (volume E)
- Striped volumes display aqua marine strips (volume F)
- Mirrored volumes display burgundy red strips (volume G)

Figure 5-10

What the different volumes look like



In the real world, you wouldn't carve up disks as you would on client computers—there would be no point. But you may have client computers with two, three, four, or even six disks. On a computer with six disks, for example, you might want to create a spanned volume on disks 2, 3, and 4 so they appear in Windows Explorer as a single drive (such as drive E). It can be less confusing for end users. Then you could mirror disks 5 and 6 to create a mirrored volume for sensitive data that requires fault tolerance.

MORE INFORMATION

To learn more about formatting disks and disk types, visit http://windows.microsoft.com/en-GB/windows7/Formatting-disks-and-drives-frequently-asked-questions and http://windows.microsoft.com/en-GB/windows7/Create-and-format-a-hard-disk-partition

Understanding Storage Device Types

Windows 7 supports many different types of storage devices in addition to ordinary hard disks. Other storage device types include eSATA, USB and USB 2.0, IEEE 1394 (FireWire), and iSCSI.

CERTIFICATION READY
What types of storage devices does Windows 7 support?
5.2

There are many different types of storage devices supported in Windows 7. This section explains eSATA, USB and USB 2.0, IEEE 1394 (FireWire), and iSCSI.

External Serial Advanced Technology Attachment (eSATA)

External Serial Advanced Technology Attachment (eSATA) is an external interface for SATA technologies. eSATA competes with IEEE 1394 (also called FireWire 400) and universal serial bus (USB) 2.0. eSATA is very fast, with read access times of 12.7 milliseconds (ms), read throughput of 93.5 MB/s, and a write throughput of 94 MB/s. In a nutshell, eSATA has a maximum speed of 300 MB/s for 3 Gb/s SATA connections, which is three times faster than either USB 2.0 or FireWire 400. eSATA cables can be up to 6.56 feet or 2 meters in length and are narrow. An eSATA cable is shown in Figure 5-11.

Figure 5-11

An eSATA cable

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However, there is one negative aspect—eSATA requires its own power connector (USB 2.0 and FireWire 400 do not). The reason eSATA can transfer data so quickly is because eSATA requires no translation between the interface and computer. This also helps save computer processing resources.

Universal Serial Bus (USB) and USB 2.0

Universal serial bus (USB) was a standard developed in the mid-1990s that defines cable connectors and protocols used to connect external devices to a computer. The devices include keyboards, digital cameras, portable media players, and external hard drives, to name a few. One type of USB cable is shown in Figure 5-12.

Figure 5-12

A USB cable

© Lev Mel/iStockphoto

USB version 1.0 had data transfer rates of 1.5 megabits per second (Mbp/s) at low speed and 12 Mbps at full speed.

USB 2.0 increased this speed to 480 Mpbs, which is 40 times faster. USB 2.0 has a read access time of 13.3 milliseconds (ms), a read throughput time of 40.1 megabytes per second (Mbps), and a write throughput of 30.9 Mbps. USB cables can be up to 16.4 feet (5 meters) in length.

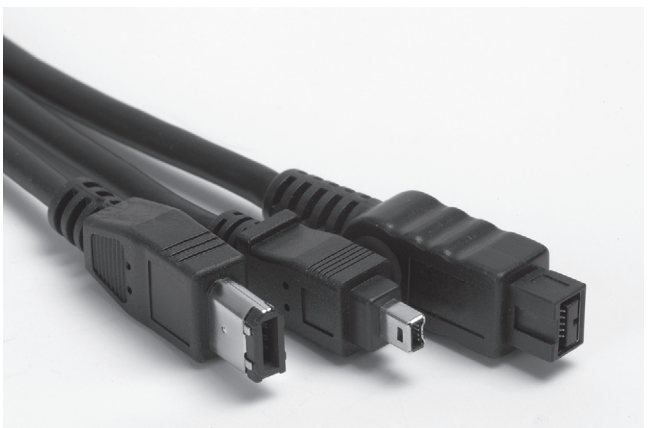
USB 3.0 is the newest version and boasts transfer speeds up to 5 gigabits per second (Gbps). For this reason it has acquired the nickname SuperSpeed. USB 3.0 ports don't need as much power and are backward compatible with USB 2.0 ports.

IEEE 1394 (also known as FireWire)

IEEE 1394, also known as ***FireWire*** and i.link, has been around for many years and has undergone several revisions. One of the original reasons behind the creation of IEEE 1394 was to serve as an interface between the computer and a digital video camera so that video could be imported for editing. Today, IEEE 1394 is used for many different types of high-speed data transfers, including video, and serves the same purpose as USB. Several types of IEEE 1394 cables are shown in Figure 5-13.

Figure 5-13

IEEE 1394 cables



© Hans-Walter Untch/iStockphoto

IEEE 1394 supports plug-and-play technology, hot swapping, multiple speeds on the same bus, ***isochronous data transfer*** (which means a constant data rate), as well as providing power to peripheral devices.

The original standard, FireWire 400 (1394a), provides 400 Mbps throughput and isochronous transfer with read access times of 13.3 ms, read throughput of 40.1 Mbps, and a write throughput of 30.9 Mbps. FireWire 800 (1394b) doubled the throughput to 800 Mbps. IEEE 1394 supports cable lengths up to 14.76 feet (4.5m).

Internet Small Computer System Interface (iSCSI)

While all other storage devices covered in this lesson are mainly for consumer products to connect peripheral devices to laptops and desktop computers, ***Internet Small Computer System Interface (iSCSI)*** connects enterprise network storage devices such as a storage area network (SAN). iSCSI is used to transfer data over local area networks (LANs), wide area networks (WANs), and even the Internet.

Understanding Cloud Storage

Cloud services are becoming highly popular, and they provide convenient storage and application hosting for consumers and businesses alike.

CERTIFICATION READY
What is the purpose of cloud storage, such as Windows Live SkyDrive, OneNote to SkyDrive, and Windows Live Mesh?
5.2

If you've been in the IT industry for any length of time, you've probably seen outsourcing of data storage. Generally, when a company outsources the storage of its data, another company assumes the burden of maintaining all the storage devices and data backups. ***Cloud storage*** is remote data storage with backups, but can also include application hosting. You can use applications like Microsoft Word and Outlook, along with many other applications, over the Internet. Client machines can run applications from the cloud and access data; in fact, they can maintain complete control of their data and security.

Windows Live SkyDrive

Windows Live SkyDrive is a great way to experience the touch and feel of cloud services, and you can't beat the price—it's free. Originally named Windows Online Folder, Window's SkyDrive is a reliable password-protected online service offering file storage that enables people to share files and photos. Each person receives 25 GB of free online storage.

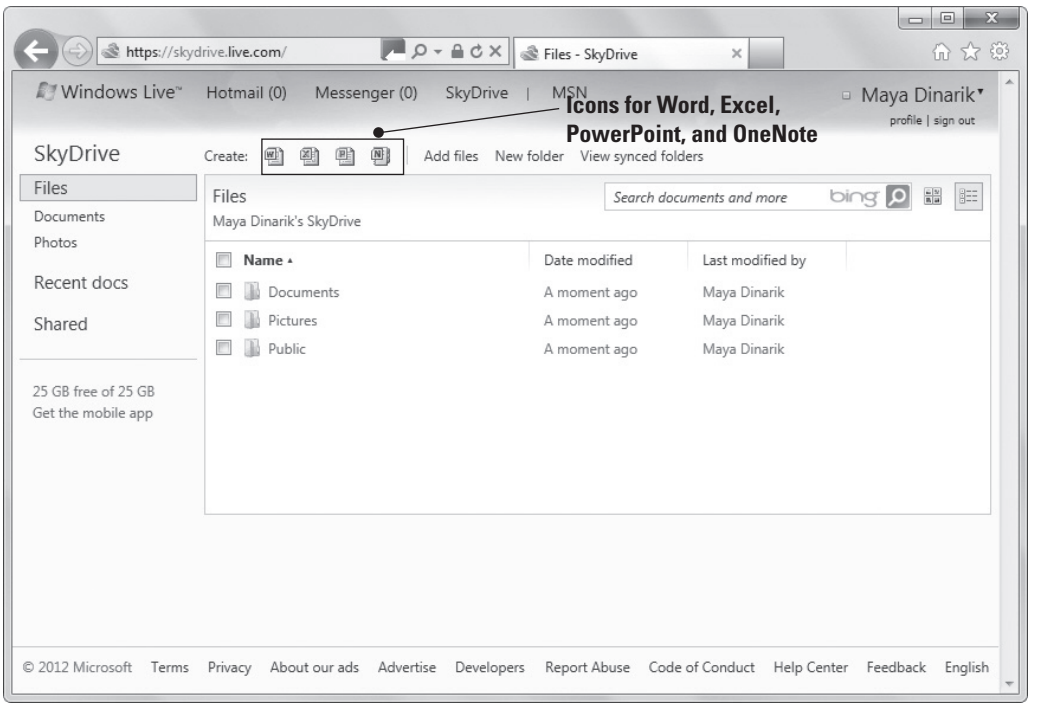
All you need to get started is a Windows Live login ID—no installation is necessary.

EXPLORE WINDOWS LIVE SKYDRIVE

GET READY. To explore Windows Live SkyDrive, perform the following steps:

1. Launch Internet Explorer and go to ***https://Skydrive.live.com***. The sign in page appears.
2. Sign in using your Windows Live ID. If you don't have a Windows Live ID, you can sign up for one on this page by clicking the **Sign up** button and typing the answers to a few questions; it takes just a few minutes.
3. After you sign in, the SkyDrive home page looks similar to Figure 5-14. Starting in the upper-left corner, there are five top-level menus: Windows Live, Hotmail, Messenger, SkyDrive, and MSN.

Figure 5-14
The SkyDrive home page



4. Hover your mouse pointer over the **Windows Live** menu to see its submenu items: Home, Devices, Mobile, Downloads, and All services.

The menu items are described as follows:

- **Home:** Takes you to the Windows Live home where you can perform tasks such as: check your Hotmail account or sync up your social media with Messenger social, which links your Facebook, MySpace, and LinkedIn to a central console.
- **Devices:** Allows you to add computers and mobile phones that you want to link together. (Phones must use the AT&T cellular service.)
- **Mobile:** Allows you to get Windows Live for your phone, set up SMS services, and set 5 GB of SkyDrive synced storage.
- **Downloads:** Takes you to a page to download Windows Live Essentials.
- **All Services:** Lists a wealth of services you can set up from calendaring options to Hotmail to setting up computer security for your family. Family Safety software creates activity reports to monitor your kids' computer activity; you can choose Web sites, games, and programs that are accessible and you can even specify time periods when they can use the computer.

The Hotmail menu provides the following links: Inbox, Calendar, Contacts, and Send email. These commands allow you to use your Hotmail e-mail account to view e-mail in your inbox, set up calendar events, and create a list of contacts that can be used to send e-mails, instant messages and many other things. The Send email link allows you to send an e-mail from your Hotmail account.

The Messenger menu allows you to instant message friends who are currently online and that you have previously added as a contact.

The SkyDrive menu has links to Files, Documents, Photos, Recent docs, Shared, Groups, and Photos of you. You can also create new Office documents like Word, Excel, PowerPoint, and OneNote.

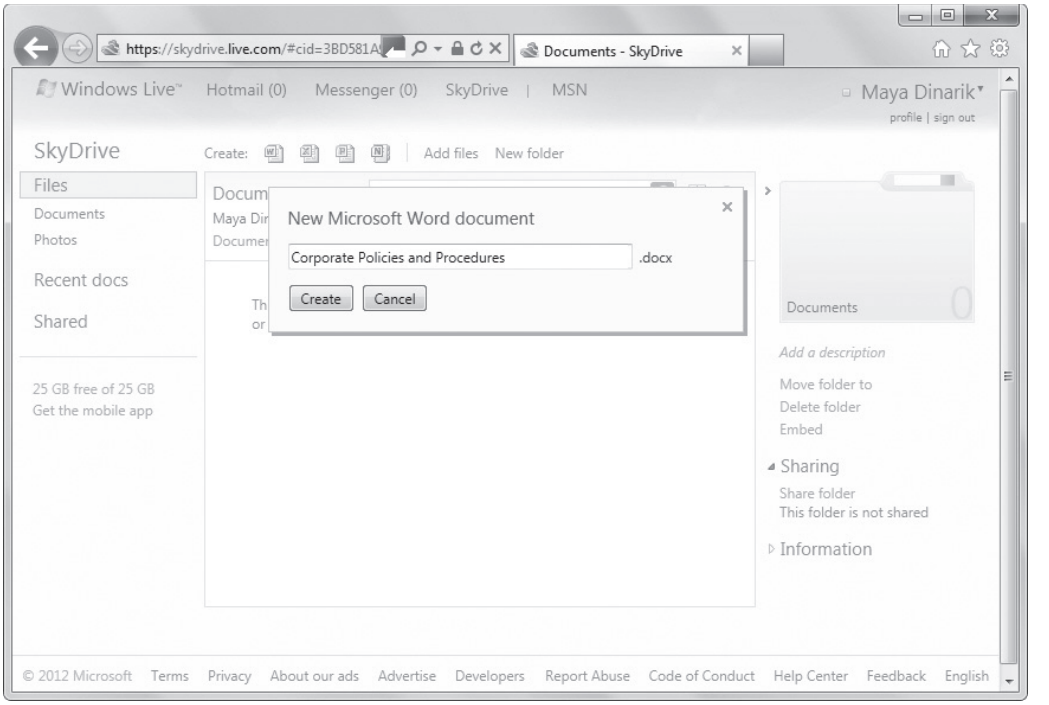
The MSN menu provides links to MSN Home, Autos, Games, Money, Movies, Music, News, Sports, and Weather.

As shown in Figure 5-15, the SkyDrive section on the left displays Files, which is a top-level folder. The Documents and Photos folders are nested under the Files folder. There are two Quick views:

- Recent docs, which shows the documents you have recently opened.
- Shared, which are documents that other people have shared with you.

Figure 5-15

Creating a Word document



The main section of Figure 5-14 is where you can create your own Office documents and additional folders to help organize your documents. The maximum size of each file is 100 MB. Each file or folder on SkyDrive has a unique Web address (URL), which makes it easy to paste that link into e-mail messages or other documents for direct access. There are also quick-start icons to create Word, Excel, PowerPoint, and OneNote documents.

CREATE A DOCUMENT IN SKYDRIVE

GET READY. To create a new document in SkyDrive, perform the following steps:

1. Open the folder you want to store the new document in, such as Documents.
2. Click the appropriate icon near the top of the window (click the **Word** icon to create a Word document, for example), and type a name for the file.
3. Figure 5-15 shows a new Word document being created named **Corporate Policies and Procedures**. Click **Create.** The document opens so you can begin typing. When you are finished, close and save the document.
4. You are returned to the Documents folder. If this is the first document you created or added to the Documents folder, your view should look similar to Figure 5-16.

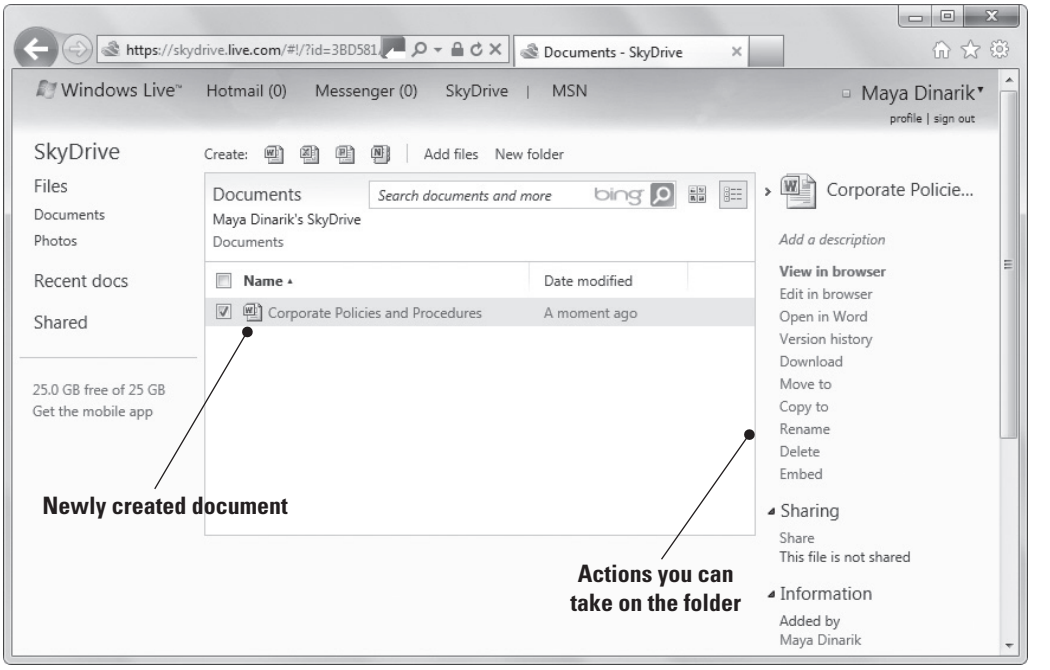


Figure 5-16

The contents of Documents after adding a Word document

To open any files listed in Documents, just click the file name.

With a file selected (make sure the check box to the left of the file name is checked), notice the menu on the right side of the window. You can view the document in the browser, open it in Word on your computer if you have Word installed, view the document's version history (which shows when changes were made and by whom), download the document to your computer or device, move the file to another folder, copy the file, rename the file, delete the file, or generate HTML code to embed in a blog or Web page that allows users to view the document.

The Sharing section provides a Share link, which you click to share the document with other users. Next, you'll learn how to share a document in SkyDrive.

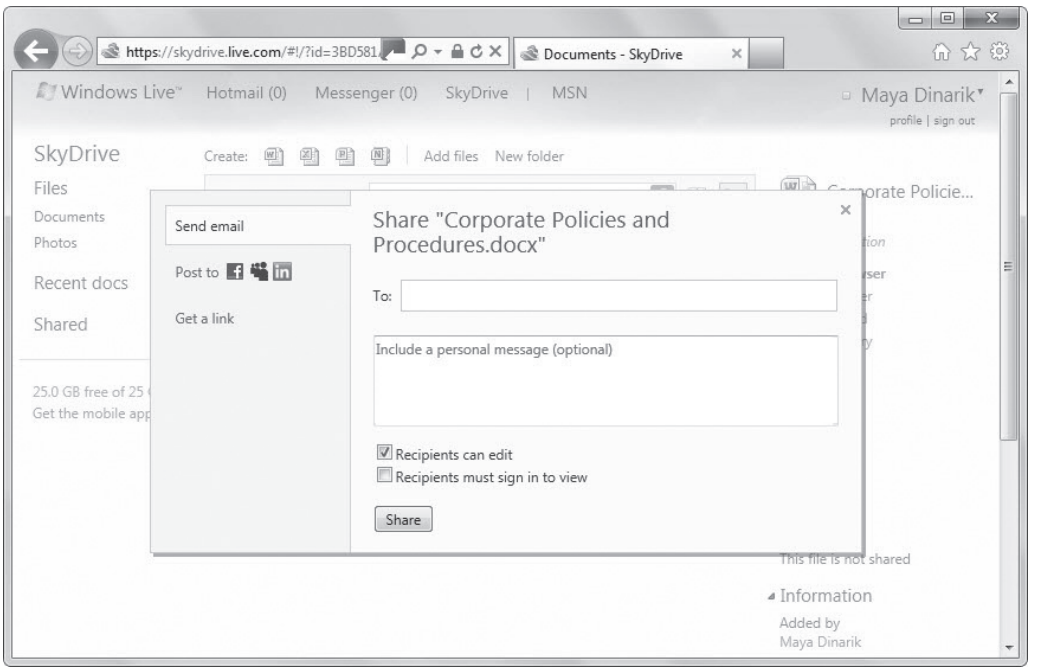
SHARE A DOCUMENT IN SKYDRIVE

GET READY. To share a document in SkyDrive, perform the following steps:

1. With the document selected in folder view in SkyDrive, click the **Share** link on the right side of the screen. A Share window appears, as shown in Figure 5-17. You can share

Figure 5-17

A share window

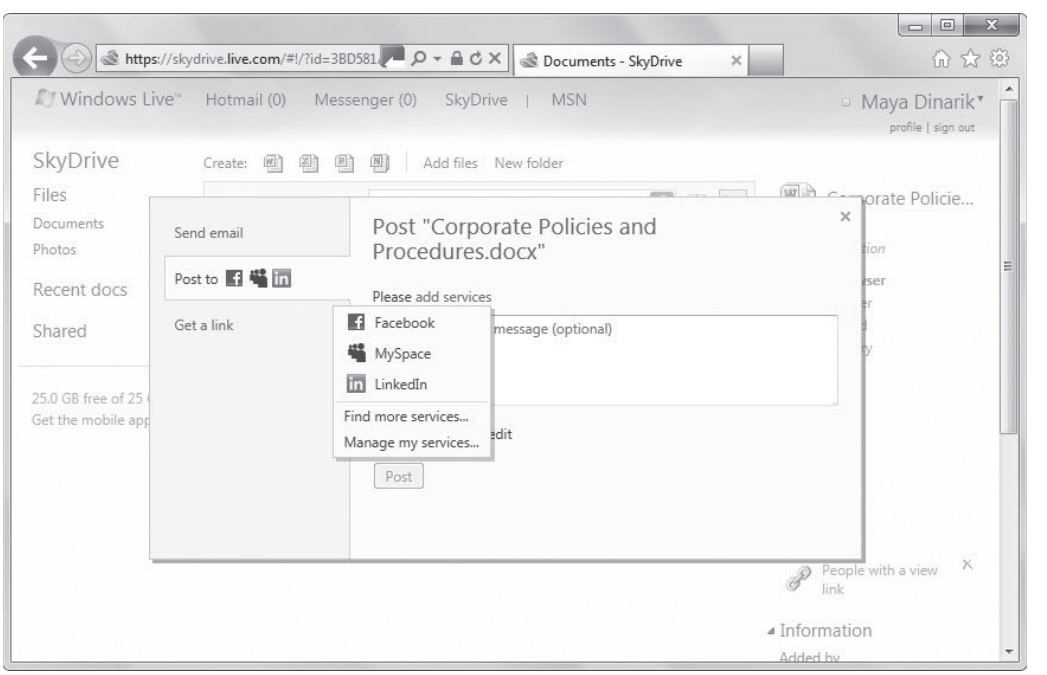


the document via e-mail from this window, post a link to a social networking site such as Facebook or LinkedIn, or get a link to include in a different e-mail or document.

2. To share the document via e-mail, type one or more e-mail addresses in the To field. You can also type the names of contacts that's are your Windows Live contact list. Enter a personal message in the text box below the To field, if you want. If you want the recipients to be able to edit the document, leave the **Recipients can edit** check box checked. You can require recipients to sign in to SkyDrive by checking the **Recipients must sign in to view** check box. When you're ready, click **Share**. The recipients receive an e-mail with a link to the document.
3. To share via a social networking site, click **Post to** in the left pane. Click the **add services** link, and then select a social networking site from the list or click **Find more services** to add a new site (see Figure 5-18). Enter a brief message in the text box, and then click **Post**.

Figure 5-18

Posting a link to a social networking site



4. Another way to share the document is to click the **Get a link** option in the right pane. Three options appears: View only, View and edit, and Make it public! (see Figure 5-19). Click the **Get a link** button that's appropriate to how you want to share the document. Doing so displays a link you can copy and paste into an e-mail or document for direct access, as shown in Figure 5-20.

Figure 5-19

Get a link options

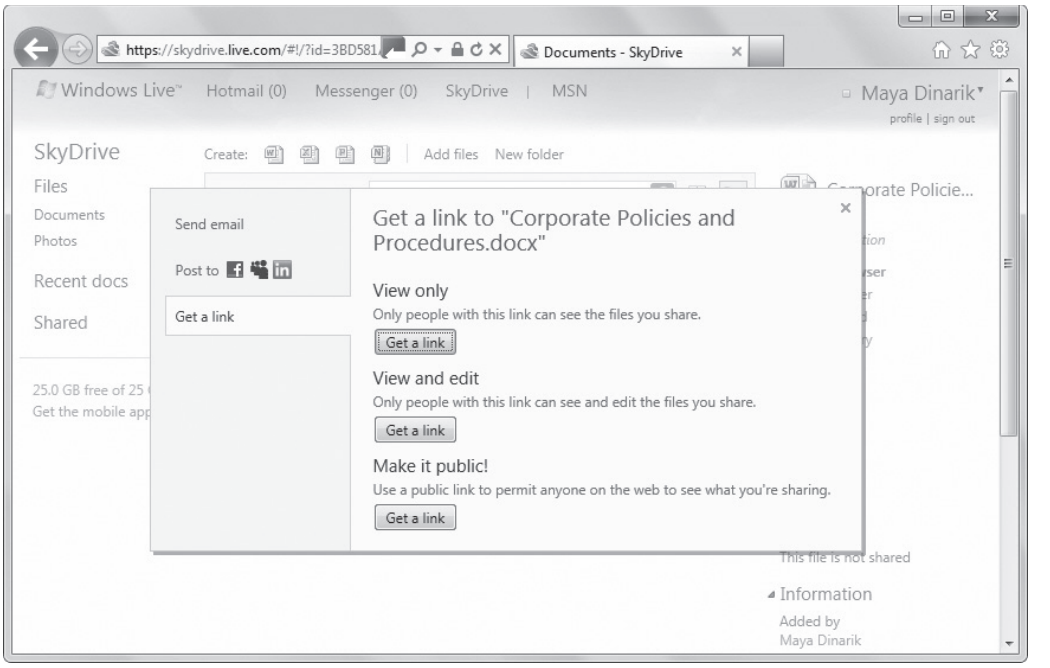
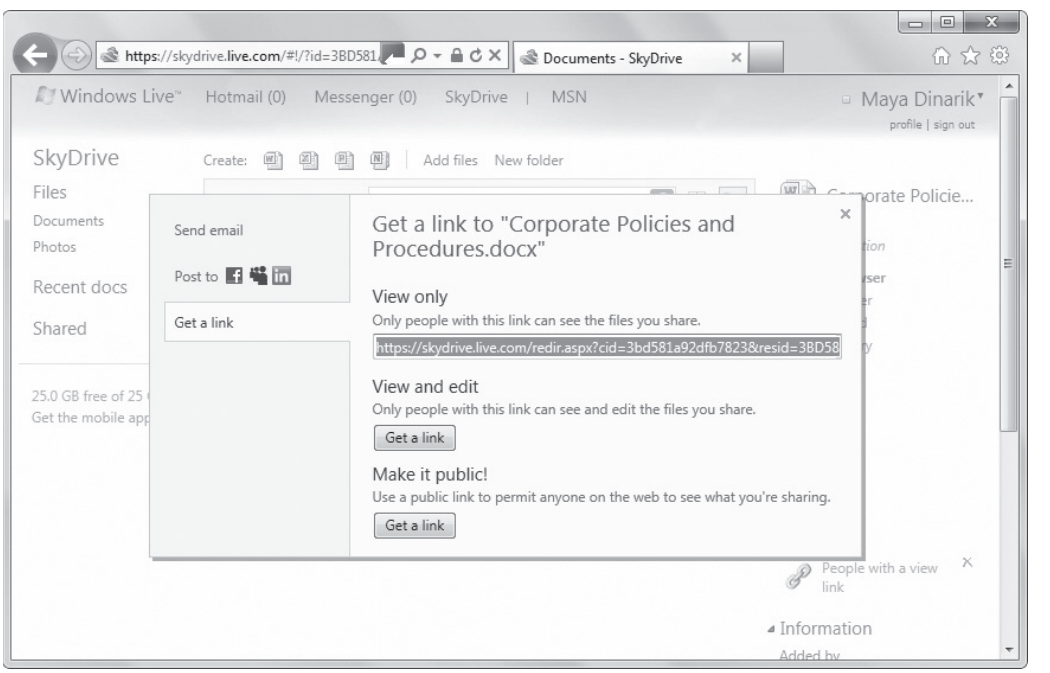


Figure 5-20

A unique link is generated for sharing



5. Click the X in the upper-right corner of the link dialog box to close it, if necessary.

Click Documents near the upper-left part of the window. The Create menu enables you to create new files and folders. You've already seen how the Word, Excel, and other file icons work. Now you'll learn how to create a folder in SkyDrive.

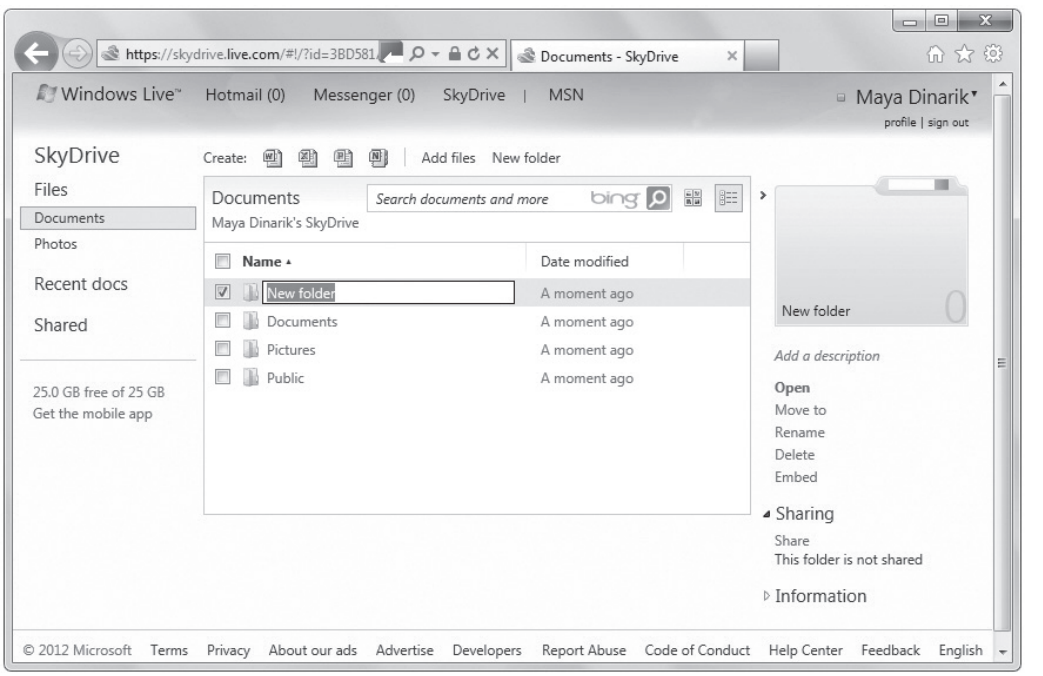
CREATE A FOLDER IN SKYDRIVE

GET READY. To create a new folder in SkyDrive, perform the following steps:

1. In SkyDrive, click the **New folder** link on the toolbar.
2. Type a name for the new folder (see Figure 5-21). If you decide to share the folder, the process is the same as sharing documents, described in the "Share a File in SkyDrive."

Figure 5-21

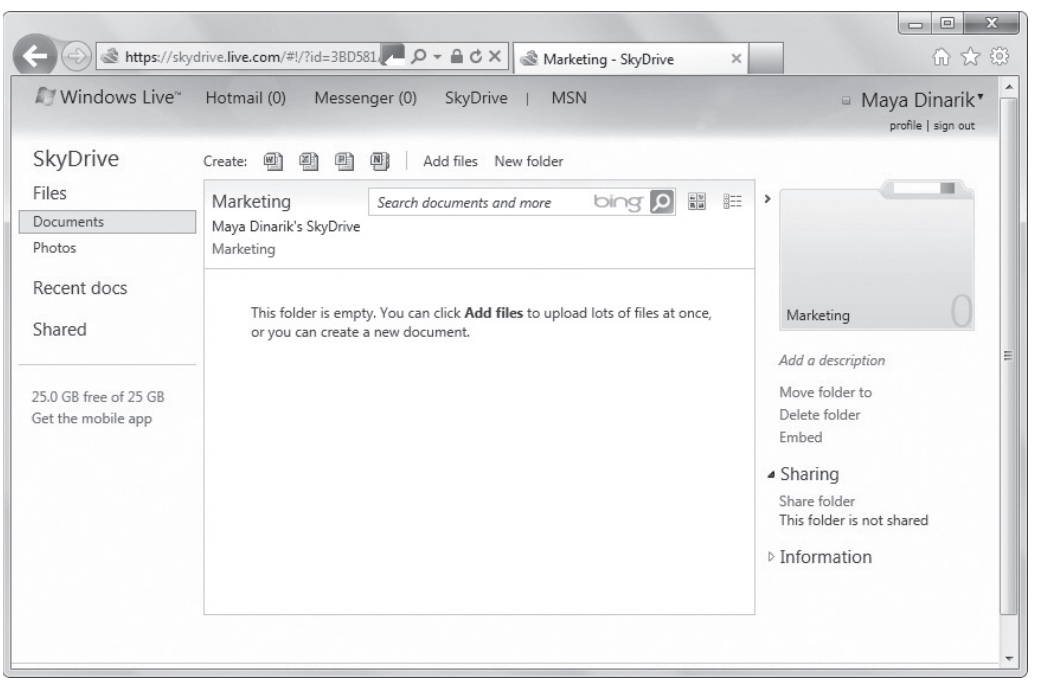
Creating a new folder



3. Click the new folder to open it. You can drag and drop documents into the folder or click-select documents from your computer and browse to the files you would like to add. You can also click **Add files** to upload files from your computer (Figure 5-22).

Figure 5-22

Click Add files to upload files from your computer to a SkyDrive folder



OneNote to SkyDrive

OneNote is an application that allows multiple users access to a shared set of notes all at the same time. Everyone's changes are automatically synchronized to the notebook, so the notebook is current. OneNote saves an offline copy on each user's computer so she can edit the notes even when she's not connected to the network. When she connects, OneNote automatically merges her changes with the Notebook along with everyone else's changes. When a user adds new sections, pages, and links in OneNote, the program displays the name of the user (author) who added them.

There are four views to choose from in OneNote:

- **Editing View:** Allows the notebook to be edited
- **Reading View:** Removes extra information like author names and dates of changes
- **Show Authors:** Displays the authors of sections, pages, and notebooks
- **Page Versions:** Shows various versions of a page

CREATE A ONENOTE NOTEBOOK

GET READY. To create a new notebook in OneNote, perform the following steps:

1. Sign in to SkyDrive by opening Internet Explorer, going to ***https://Skydrive.live.com***, and signing in.
2. Create a new notebook by clicking the **OneNote** icon near the top of the window.
3. Type a name for the new notebook.

To share a OneNote notebook, follow the same steps you followed for sharing the SkyDrive My Documents folder covered in the previous section.

Windows Live Mesh

Windows Live Mesh is a part of the Windows Live Essentials suite. Windows Live Mesh enables you to keep data synchronized between computers (and some devices such as mobile phones) as well as some program settings. Data is synced using the online service, and there are some limitations to the amount of storage space you get: You can sync up to 200 folders, which can each grow as large as 50 GB in size and can contain up to 100,000 files. Like SkyDrive, Windows Live Mesh is a free service.

You need to install Windows Live Mesh on each computer for which you want keep the data synchronized. As you sync folders between computers, the changes that you make on one computer are automatically changed on the other computer when they are online at the same time. The contents of the synced folders are saved locally on each computer so you still have access to the data even if you are not connected to the Internet. Data transfers are encrypted via the Transport Layer Security (TLS) or Secure Sockets Layer (SSL) protocols.

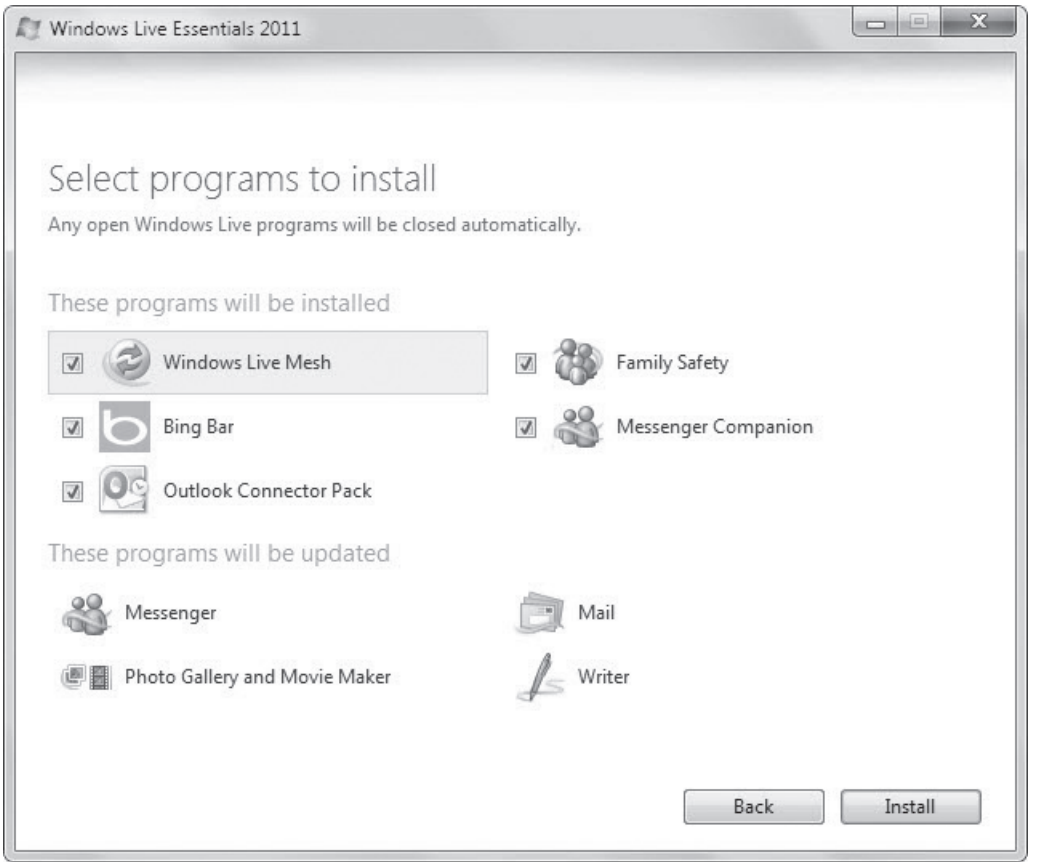
INSTALL WINDOWS LIVE MESH

GET READY. To install Windows Live Mesh, perform the following steps:

1. Launch Internet Explorer and go to ***http://explore.live.com/windows-live-mesh***.
2. Click the **Download now** button.

3. Save the **wlsetup-web.exe** file to your computer (such as in the Downloads folder).
4. Locate and double-click **wlsetup-web.exe**.
5. On the What do you want to install? screen of the installation wizard, you can choose to install all of Windows Live Essentials or you can install individual programs. For this example, choose to install individual programs. The screen shown in Figure 5-23 displays.

Figure 5-23
Installing Windows Live Mesh



6. Uncheck all programs other than **Windows Live Mesh** and then click **Install**. Follow the prompts to install the software.
7. Restart your computer.

To use the program, click Start > All Programs > Windows Live > Windows Live Mesh. Sign in using your Windows Live ID and password.

From the Windows Live Mesh Status page shown in Figure 5-24, you can synchronize folders, your Internet Explorer favorites, and Microsoft Office settings (such as styles, templates, custom dictionary, and e-mail signatures). You can also go to Windows Live Devices to add more devices, such as computers with which you want to synchronize.

Click Go to Windows Live Devices to open the Windows Live Devices page (Figure 5-25). If you add devices using SkyDrive, you'll see the same devices here because all Windows Live products are linked. Choose to add a computer or phone and then answer a few short questions.

A computer in the syncing pair might show a status of *Remote connections aren't available.* The remote connections feature allows you to connect to a machine across the Internet

Figure 5-24

The Windows Live Mesh Status page

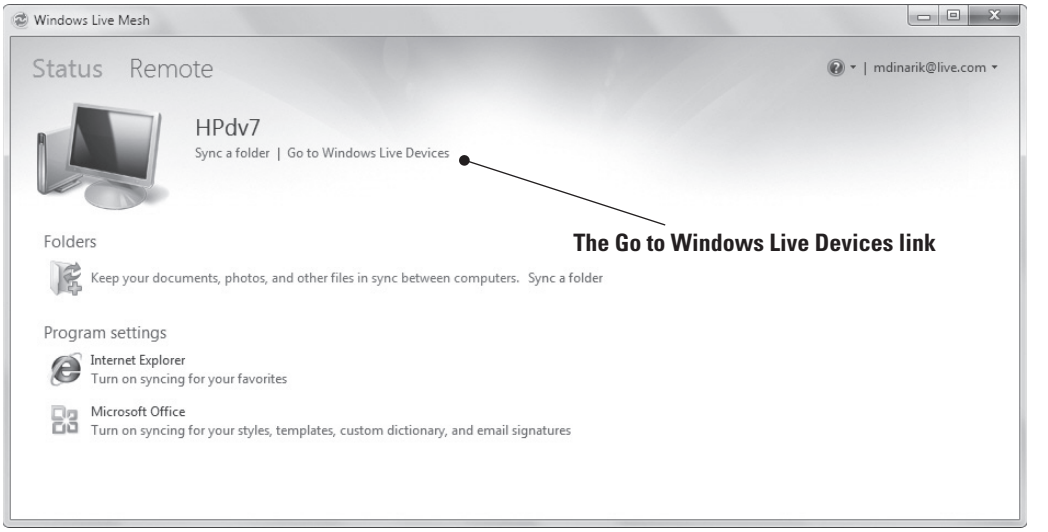
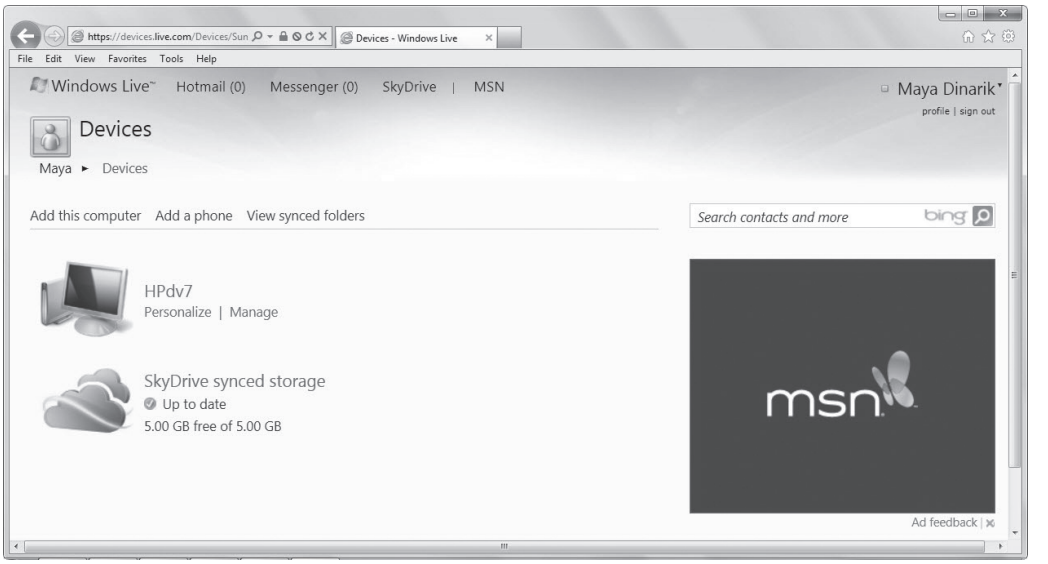


Figure 5-25

The Windows Live Devices page



and access the data as if you were physically on that machine. Windows Live Mesh requires computers to allow remote connections. Remote connections are encrypted using Secure Sockets Layer (SSL), so they are safe to use.

To enable remote connections from the Windows Live Mesh Status page, click Remote in the upper-left corner. Figure 5-26 shows the Windows Live Mesh Remote page.

In the Remote connections to this computer section, the default setting is *You don't allow remote connections to <computer name>*. If you're not sure if you want to allow remote connections to this computer, click the *What happens when I allow them?* link. The Windows Live Mesh and Devices Help Center displays, where you can review some of the most commonly asked questions about remote connections.

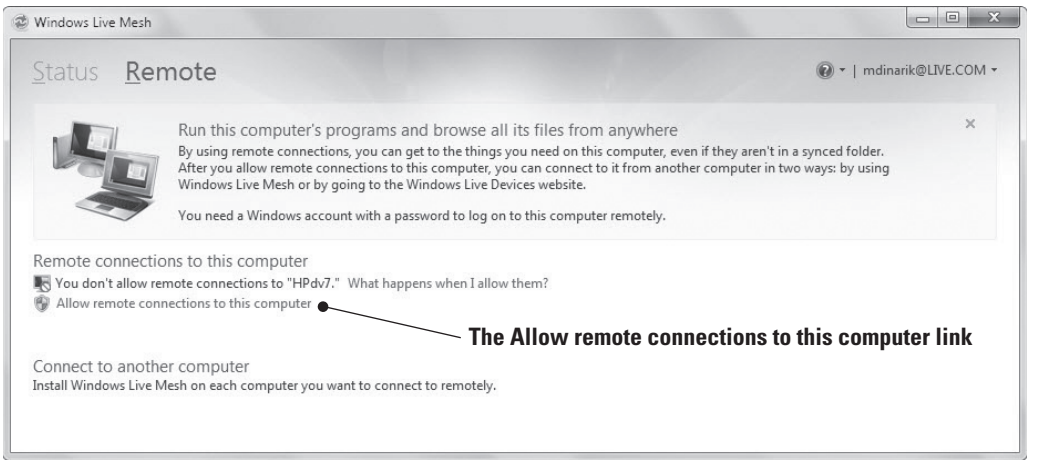
When you're ready to allow remote connections, click *Allow remote connections to this computer.* The *Allow remote connections to this computer link* changes to *Block remote connections.* Just click *Block remote connections* if you want to stop allowing remote connections to this machine.

TAKE NOTE*

All machines you wish to remotely connect must have Windows Live Mesh installed and must have been added to the Windows Live Devices Web site.

Figure 5-26

The Windows Live Mesh Remote page



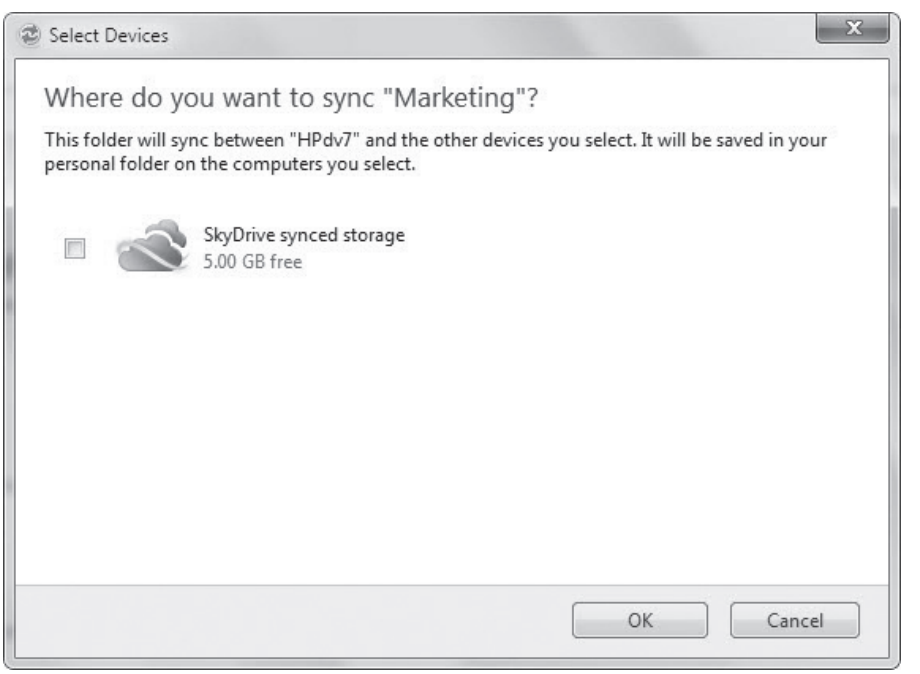
USE WINDOWS LIVE MESH TO SYNC A FOLDER

GET READY. To sync a folder using Windows Live Mesh, perform the following steps:

1. Click the icon in the taskbar to display the Windows Live Mesh Status page and then click the **Sync a folder** link.
2. Browse to the folder you'd like to sync, select it, and then click the **Sync** button.
3. The Where do you want to sync *foldername* page displays. Select the computer or online folder you want to sync with (Figure 5-27) and then click **OK.**

Figure 5-27

Syncing a folder

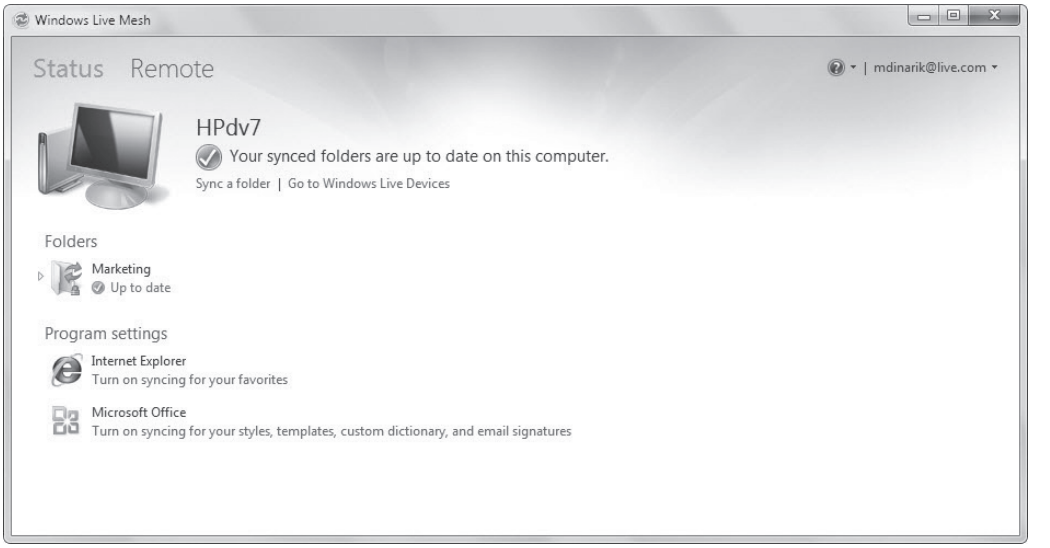


On the Windows Live Mesh Status page, you should see a green circle with a white check mark and text that reads *Your synced folders are up to date on this computer* (see Figure 5-28).

To enable synchronization of your Internet Explorer favorites on the same page, in the Program settings/Internet Explorer section, click *Turn on syncing for your favorites.* To synchronize your Microsoft Office settings, click *Turn on syncing for your styles, templates, custom*

Figure 5-28

The Windows Live Mesh Status page showing that folders are synced



dictionary, and email signatures. Once they are successfully synced, you will see *Syncing turned on.*

If you ever need to turn syncing off, you can click the icon (either Internet Explorer or Microsoft Office) to open the details and then click *Turn off syncing.*

MORE INFORMATION

To learn more about Windows Live Mesh, visit http://explore.live.com/windows-live-mesh

Understanding Printing Devices

THE BOTTOM LINE

Printing devices can be local or networked; they can even be available over the Internet. You can perform most printer support from the Devices and Printers applet.

Printers can be either local or networked. Microsoft has historically used the term "print device" to refer to the actual hardware, but is now using the term "printer" in most consumer-level documentation. You will see both "printer" and "print device" in Microsoft documentation and in this lesson.

Understanding Local Printers

CERTIFICATION READY
What is a local printer?
5.3

A ***local printer*** is connected directly to your computer via a cable, such as serial, parallel, USB, infrared, or other port type. Most printers come with a manufacturer's CD containing the printer software that must be installed for your operating system to talk to the printer. A good rule of thumb is if your printer ships with a manufacturer CD, use the setup program on the CD to install the driver. A ***driver*** is a small program that enables hardware to interact with the operating system.

CERTIFICATION READY
How can you add or remove a printer?
5.1

If you do not have a CD from the manufacturer, you can use the built-in printer drivers in Windows 7. However, it is almost always preferable to use the printer setup program on the CD or download the latest print driver setup installation file from the manufacturer's Web site than to use the built-in Windows 7 driver. The built-in driver typically provides access to a minimal subset of the printer's features.

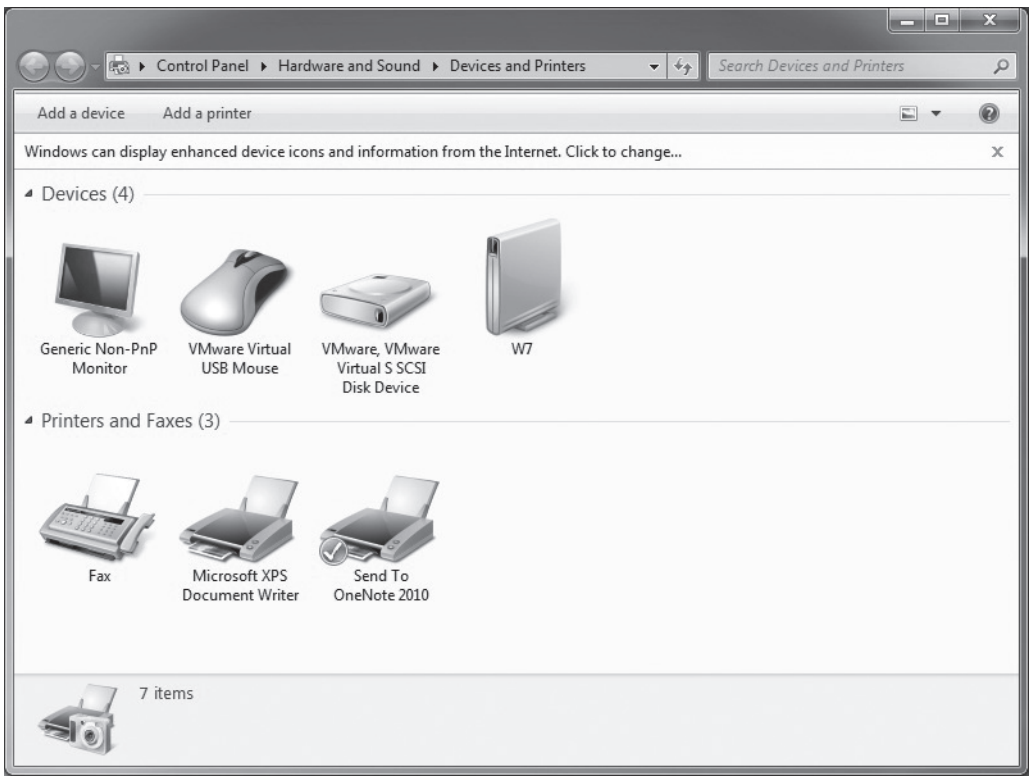
ADD A LOCAL PRINTER

GET READY. To add a local printer, perform the following steps:

1. Physically connect the printer to a computer with the appropriate cable.
2. Click **Start** > **Devices and Printers**. The Devices and Printers page displays (see Figure 5-29).

Figure 5-29

The Devices and Printers window



3. Select **Add a printer** from the menu bar or right-click in the white space on the page and select **Add a printer** from the shortcut menu. The Add Printer Wizard starts.
4. On the What type of printer do you want to install? page (see Figure 5-30), select **Add a local printer**.
5. For a local printer, on the Choose a printer port page, select the port that your printer is currently connected to: **Use an existing port** or **Create a new port**. Figure 5-31 shows the default existing ports. Your choices for creating a new port are local port or TCP/IP port (whereby you enter the IP address or name of a printer).
6. The Install the printer driver page asks for a printer driver and displays a list of manufacturers and printers. Select the manufacturer of the printer and then the printer displayed in Figure 5-32. If you do not see your printer, click the **Windows Update** button to get a more extensive list of printers to choose from.
7. When you've found your printer, click the **Have Disk** button. Ensure the CD is in the CD/DVD drive, browse to the appropriate printer model, and then click **OK**.
8. Type a name for your printer and then click **Next**.

Figure 5-30

The What type of printer do you want to install? screen

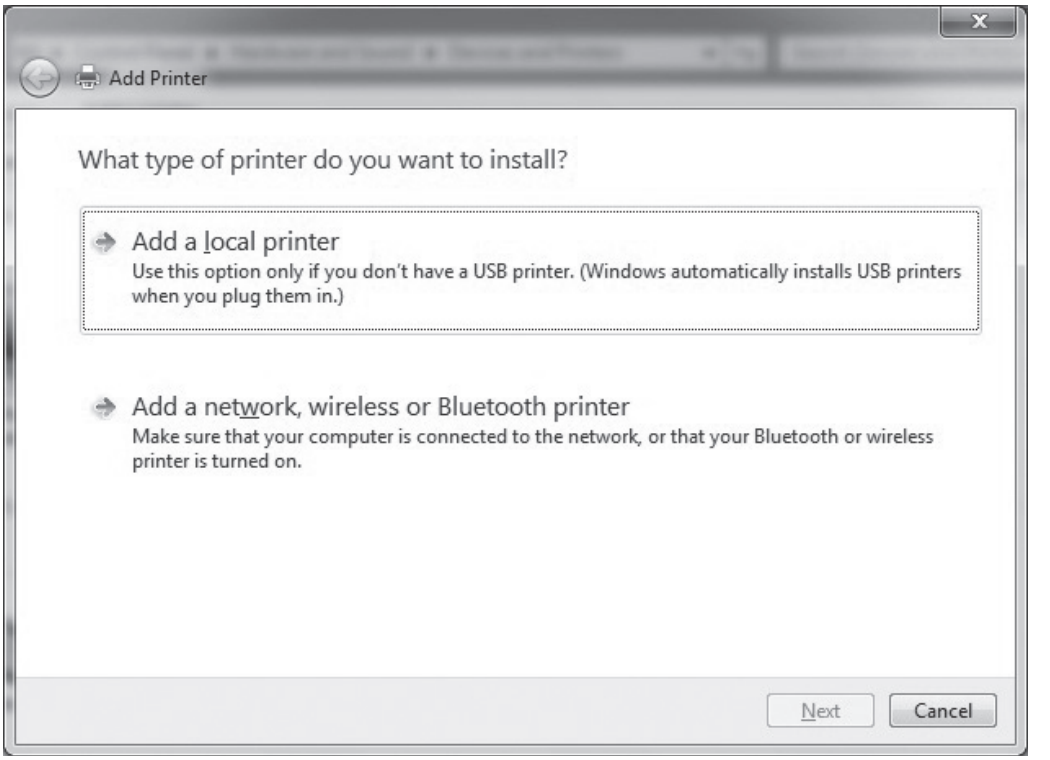


Figure 5-31

The Choose a printer port screen

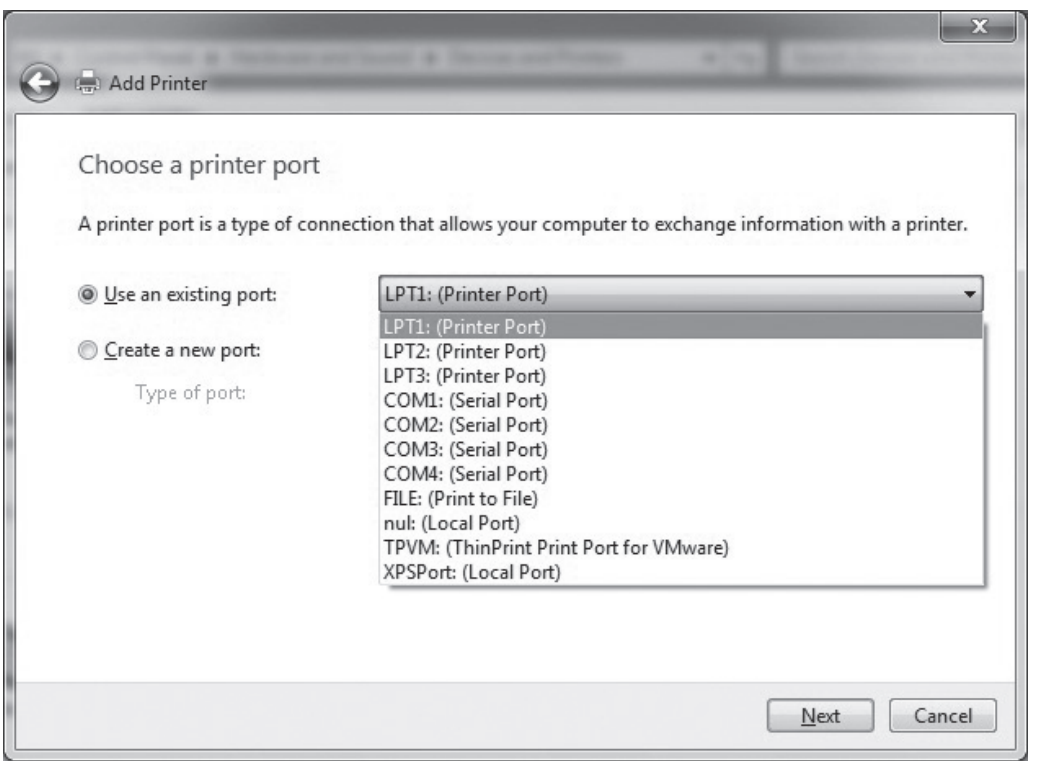
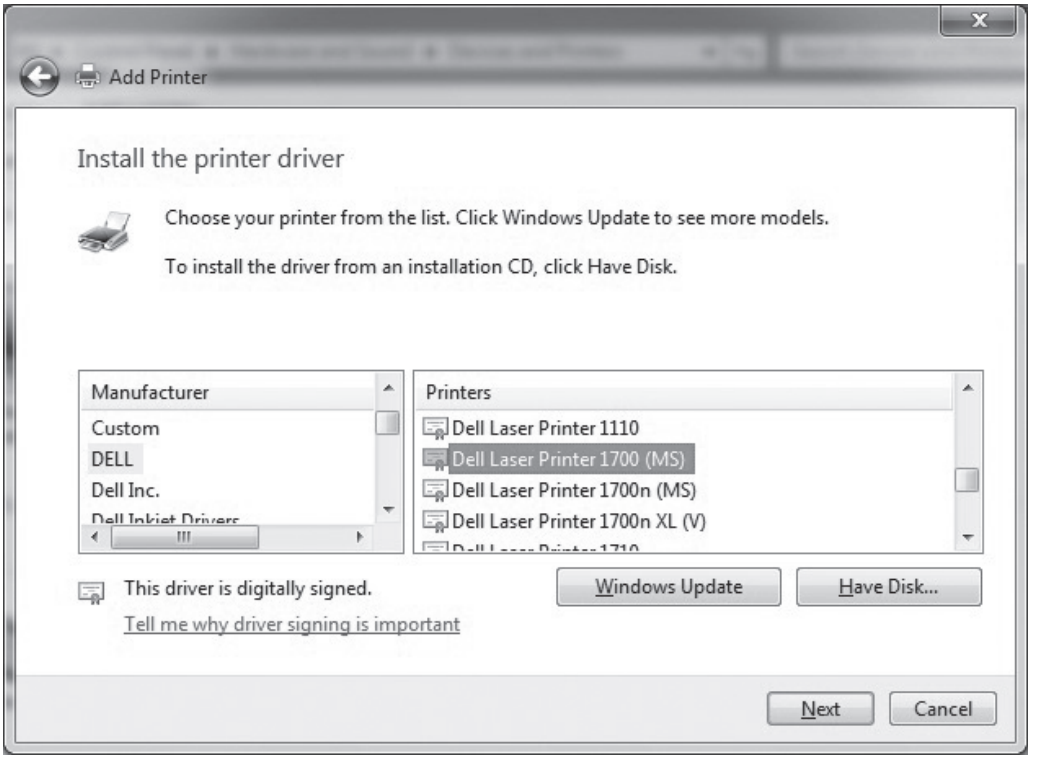


Figure 5-32

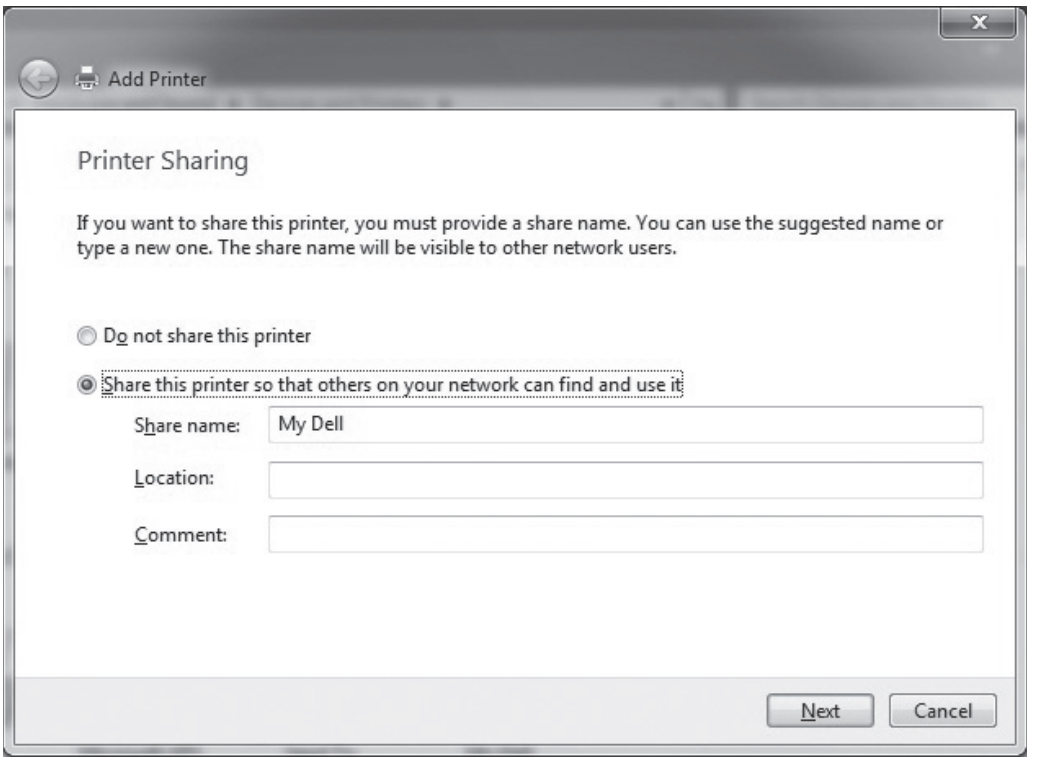
Selecting your printer



9. The Printer sharing screen displayed in Figure 5-33 allows you to share the printer so other people can connect to and use the printer across the network. The printer is local for you, but for all others connecting across the network, it's a networked printer. If you would like to share the printer, type the respective information for the **Share name**, **Location**, and **Comment** text boxes. If you do not want to share the printer, select the **Do not share this printer** option.

Figure 5-33

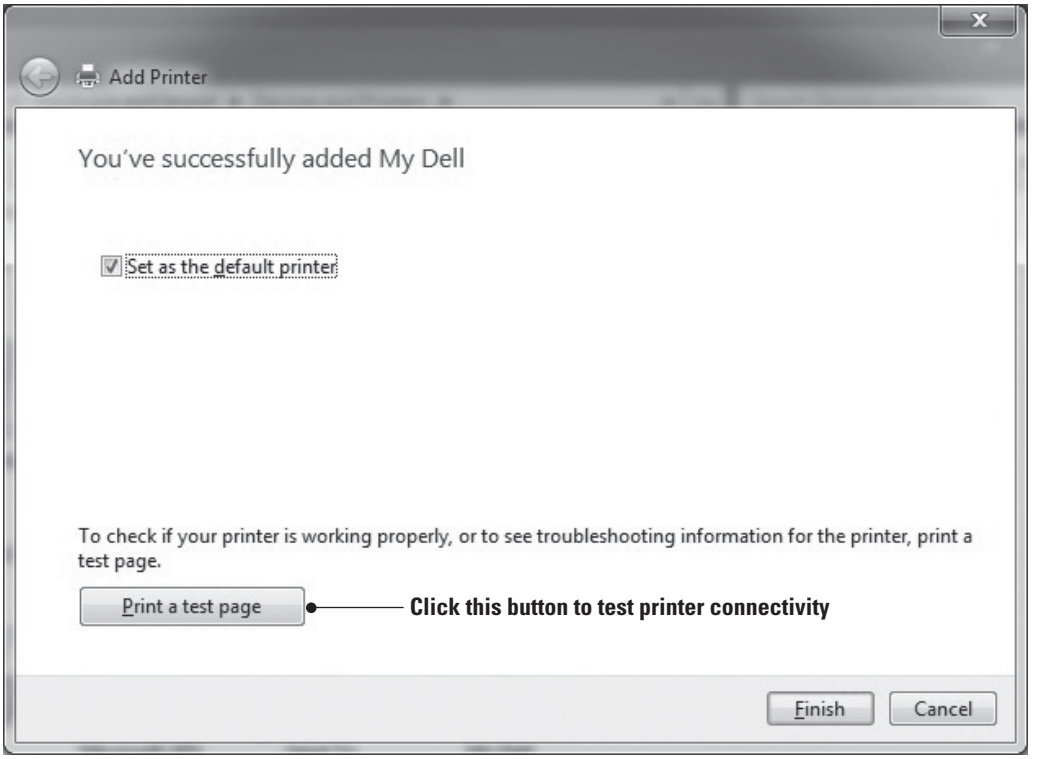
Sharing your printer (or not sharing your printer)



10. Click **Next**.
11. The message **You've successfully added *printername*** should display (see Figure 5-34). To ensure that your computer and printer are communicating properly, click the **Print a test page** button.

Figure 5-34

Successfully adding your printer



12. If a page prints properly, click **Finish**.

Your newly added printer should display in the Devices and Printers window with a green circle and a white check mark, indicating that it is your default printer. From this point forward, whenever you tell the computer to print, it automatically prints to your default printer. You can always choose to print to a different printer by selecting a different printer from the list of printers when you print a document.

REMOVE A LOCAL PRINTER

GET READY. To remove a local printer, perform the following steps:

1. Open Devices and Printers.
2. Right-click the printer that you want to remove and then click **Remove device**.

You can't remove a printer that has print jobs in the queue.

Understanding Network Printers

CERTIFICATION READY
What is a network printer?
5.3

A ***network printer*** generally has a network adapter and is connected to a network. The printer receives an IP address and is a node on the network much like a networked computer. You can share a local (directly connected) printer with others on a network; in this case, the printer is considered to be both local (to the computer to which it is connected) and networked.

However, a true network printer is most commonly connected to and shared from a network server. Connecting to a network printer requires different steps than setting up a local printer.

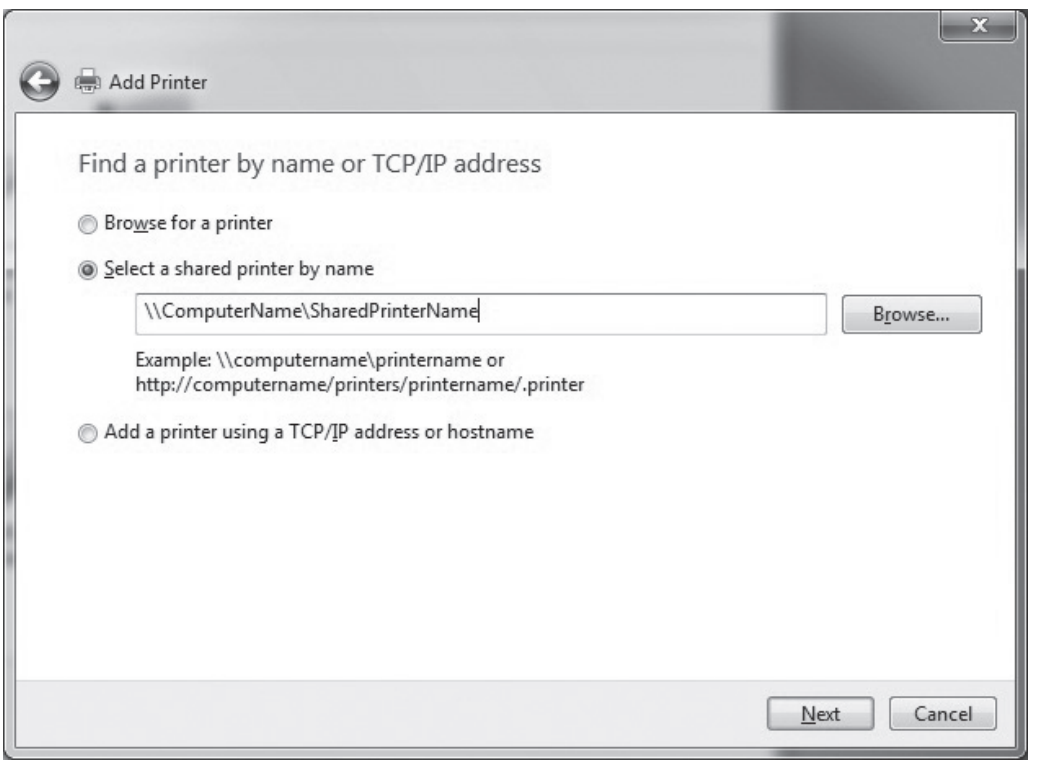
INSTALL A NETWORK PRINTER

GET READY. To install a network printer, perform the following steps:

1. Click **Start > Devices and Printers**.
2. Select **Add a printer** from the top menu or right-click a blank area on the page and select **Add a printer**.
3. On the Add Printer page, click **Add network, wireless or Bluetooth printer**. The Add Printer wizard searches for shared printers. If a list of shared printers does not display (or if the printer you are looking for doesn't display), on the Add Printer page, click **The printer that I want isn't listed**.
4. Figure 5-35 shows how you can find a printer by name or by a TCP/IP address. You can browse for a printer (chances are, however, that if it didn't show up before, it won't show up by browsing). Type the Universal Naming Convention (UNC) path to the computer name and shared printer name or add a printer using a TCP/IP address or hostname.

Figure 5-35

Adding a network printer



Some network printers on the market today use proprietary connectivity methods and can only be accessed by installing a driver that is supplied by the manufacturer.

Printing a Document

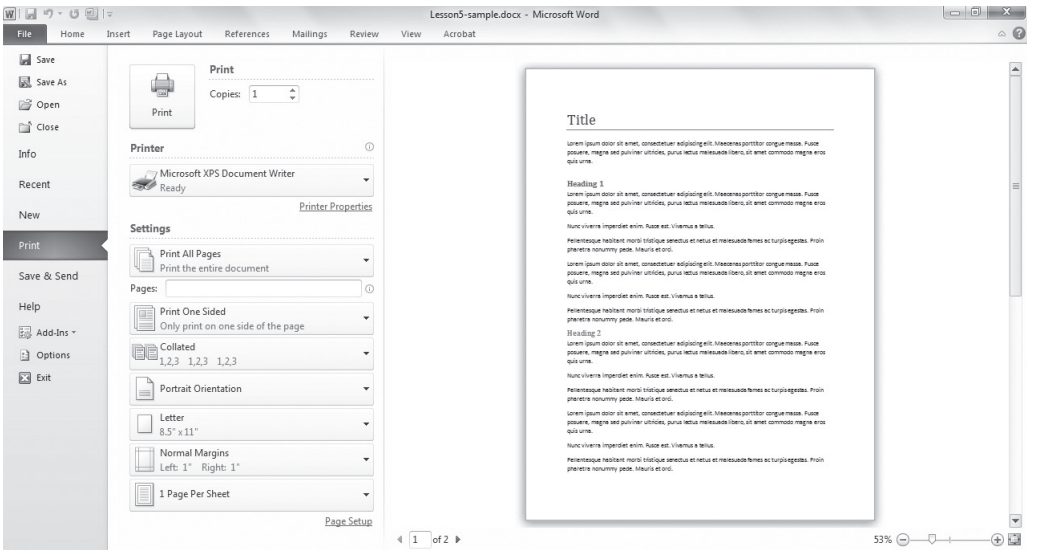
Figure 5-36 shows a document that is ready to be printed in Word 2010. You can access this page by clicking the File menu and then choosing Print. (You can alternately press Ctrl+P.)

The first option at the top of the page is the number of copies; the default is to print 1 copy but you can change this by typing a number or clicking the up and down arrows to increase or decrease the number.

The print device displays directly under the Printer heading. A status message indicates whether the printer is ready to print or not. If the printer is not ready to print, because

Figure 5-36

Printing a Word 2010 document



it's out of paper or offline, the status message indicates the problem so you can fix the issue before attempting to print. You can click the arrow to the right of the printer name and select a different printer if others are available.

The Settings section includes many print options:

- **Print All Pages:** The default setting prints the entire document; however, you can click the arrow at the right side of the option box and specify to print the current page or a custom page range. You can also use the Pages text box to print a range of pages. For example, if you have a 100-page document but want to print only pages 5 through 10, type 5-10 in the Pages text box.
- **Print One Sided:** The default is to print on one side of the paper. You can change the setting to manually print on both sides of the paper. Printers with built-in duplexers can print on both sides of the paper automatically.
- **Collated:** This setting applies to multiple copies of a document. It affects whether multiple copies are printed in order (one complete set, and then another, and so on) or all copies of page 1 first, and then all copies of page 2, and so on.
- **Orientation:** Select to print the document in portrait (upright) or landscape (lengthwise) format.
- **Size:** This option enables you to select the size of paper you are printing to. Letter 8.5 x 11 is the default for most printers.
- **Margins:** This setting enables you to change the document margins.
- **Pages Per Sheet:** This setting enables you to select the number of pages you want to print on one sheet of paper. You can typically choose from 1 to 16. The larger the number, the smaller the text will be on the printed page.

After making your selections, click the large Print button above the printer name to send the print job to the printer.

Understanding Print to File

CERTIFICATION READY
How do you print to a file?
5.3

You can also choose to print a document to a file rather than to a print device. Why? Let's say you need to send a Word file to a coworker but he doesn't have Word installed on his computer. He doesn't need to modify the file you send to him, he just needs to view the file's

contents. You can print the Word document to a file, which adds a .prn extension. When he receives the file, he can print the file to a printer.

PRINT TO A FILE

GET READY. To print to a file from Word, perform the following steps:

1. Launch Word.
2. Open the document you want to print to a PRN file.
3. Select **File > Print.**
4. On the Print page, click the arrow to the right of the printer name and select **Print to File** at the bottom of the list.
5. Click **Print** at the top of the page. In the Print to file dialog box that displays, navigate to the location on your computer where you want to save the file, type a file name in the File name text box, and then click **OK**.

TAKE NOTE*

Creating a PDF file can accomplish the same goal as a PRN file; however, you cannot save or export files to PDF from every program.

PRINT A PRN FILE

GET READY. To print a PRN file to a local printer, perform the following steps:

1. Open a command prompt window by clicking **Start**, typing **cmd** in the **Search programs and files** search box, and then selecting **cmd.exe** from the resulting list.
2. Use the cd command to navigate to the location of the file. For example, if the file is named doc.prn and you saved it to the root of drive C, type **cd c:** and press **Enter** to execute the command.
3. Execute the following command to send the file to the directly connected printer: **copy /B doc.prn *computername**printer_sharename***

   This command sends a binary (/B) copy of doc.prn to the device PRN, which is the system name for the default printer. A binary copy prevents anything in the file from changing during the process.

Understanding Print Queues

CERTIFICATION READY
What is the purpose of a print queue?
5.3

Some printers can accept multiple pages of data at one time but larger documents can take a while to print. You can think of a ***print queue*** as a holding area until the printer is finished printing the entire document. Consider a document that's over 200 pages in length. Most printers cannot actually print a job that large because they don't have enough memory to hold that many pages and print them at the same time. This is where printer queues come into play. Your print job is sent to a print queue, which stores it until the printer can accept it. The printer then prints page by page until the entire document has been printed.

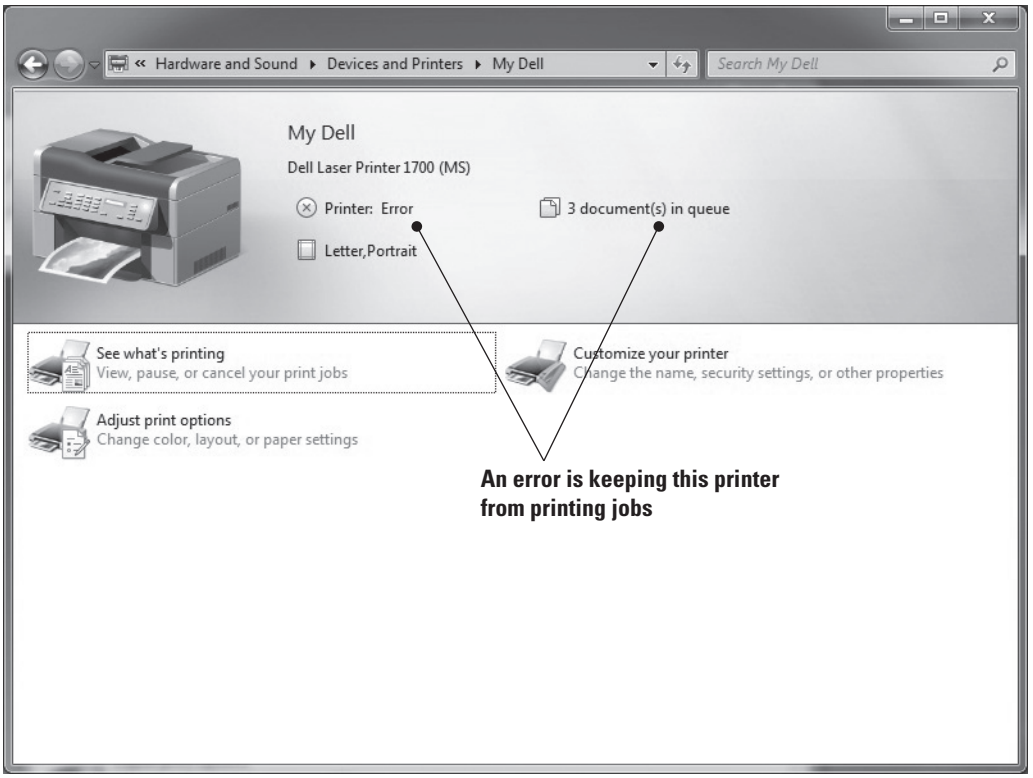
EXPLORE A PRINT QUEUE

GET READY. To explore a print queue, perform the following steps:

1. Click **Start > Devices and Printers**.
2. Double-click your printer. A page similar to Figure 5-37 displays. The printer information displayed on this screen includes:
   - The printer name
   - The printer's status (in this example the printer status = error)
   - The orientation of the printout (such as Letter)
   - The number of documents in the queue (3)

Figure 5-37

Viewing printer information



Other options on this page include:

- **See what's printing:** This is the actual print queue.
- **Adjust print options:** This includes changing color, layout, or paper settings.
- **Customize your printer:** This includes changing the printer name, security setting (who has permission to print to your printer), and other properties.

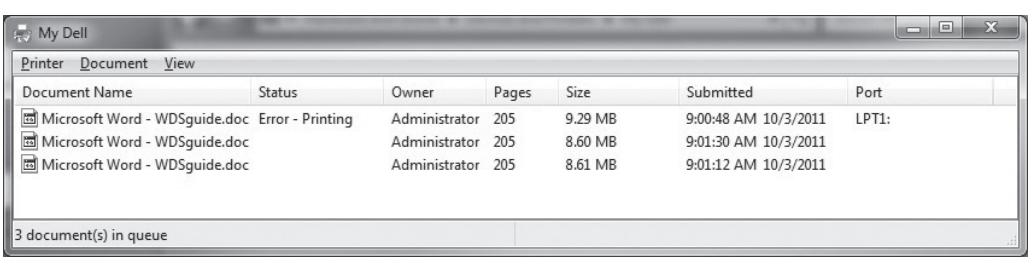
TAKE NOTE*

For network printing, it's recommended that you configure the printer to send a separator page between print jobs. This helps users easily determine where their print job ended and the next one began. You must first create a page, such as in Word, and save it to your computer or the server. The page can be blank or have the word "Separator" on it, for example. Then double-click the printer in Devices and Printers, double-click *Customize your printer*, and in the Properties dialog box that displays, click the Advanced tab, click *Separator Page*, browse to select the separator page, and click OK.

3. To open the print queue, click **See what's printing**. Figure 5-38 shows the print queue. You can view the document name, status, owner (person who sent the print job), number of pages to be printed, size of the document, date and time submitted, and the port to which the print job was submitted.

Figure 5-38

The printer queue



In this example, the first document in the print queue is in an error status. No other jobs can print until the error is resolved or the job is cancelled. If you have checked that your printer is turned on, has paper, and the ready lamp is lit, chances are you can get that job to print and then the subsequent jobs will print in turn.

The print queue window has three menus at the top: Printer, Document, and View:

- **Printer:** From this menu you can choose a default printer, set printing preferences (default orientation), print on both sides of paper, select page order, add a watermark to your pages, and set up color profiles so you can ensure that the colors you see on your screen are the colors that will be printed. Most printers today come with color profiles you can download from the manufacturer of the printer. You can also pause printing, cancel all documents (deletes all documents from the queue), share a printer (or stop sharing if it was previously shared), use the printer offline, and open the properties of the printer to make changes.
- **Document:** This menu is grayed out and thus cannot be accessed unless a document is highlighted. In the previous example, where the first print job has an error status, you could highlight that document and from the Document menu choose to restart the printing of the document or cancel the printing of the document. If you cancel the printing of the document, the next document in the queue begins printing. Other options from the Document folder include: pause, resume, and viewing properties of the document.
- **View:** This menu has two selections: Status Bar shows the number of documents in the queue on the status bar and Refresh refreshes the screen to show the most current view of the print queue.

Understanding Internet Printing

CERTIFICATION READY
How do you set up Internet printing?
5.3

If you run Windows Server 2008 R2, you can create a Web site hosted by Internet Information Services (IIS) using the Internet Printing role service. Clients can then use a Web browser to connect and print to shared printers on the server using the Internet Printing Protocol (IPP). Users must have the Internet Printing Client installed on their computers to use IPP.

INSTALL THE INTERNET PRINTING CLIENT

GET READY. To install the Internet Printing client, perform the following steps:

1. Click **Start** > **Control Panel** > **Programs**.
2. Under Programs and Features, click **Turn Windows features on or off**. Provide an administrative password or confirm to continue.
3. In the Windows Features dialog box, scroll down and expand the **Print and Document Services** option (see Figure 5-39).
4. Select the **Internet Printing Client** check box and then click **OK**.

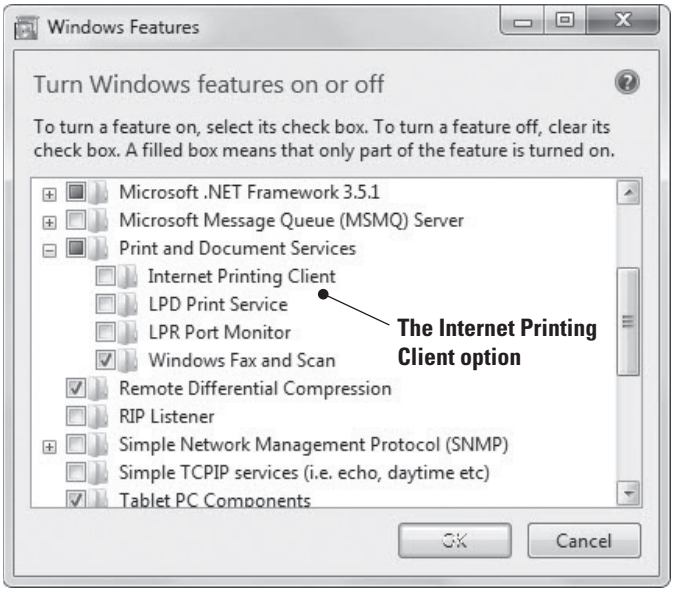
You should restart the print queue at this point to ensure that print jobs reach the printer. Just restart the Print Spooler service in the Services console to clear the print queues. (You learned about services in Lesson 4.)

MORE INFORMATION

To learn more about printing in Windows 7 and installing printers, visit http://windows.microsoft.com/en-US/windows7/Getting-started-with-printing and http://windows.microsoft.com/en-US/windows7/Install-a-printer. You can get more details about Internet printing from http://technet.microsoft.com/en-us/library/cc731857.aspx

Figure 5-39

Expanding the Print and Document Services option



Understanding System Devices

THE BOTTOM LINE

A computer requires many different devices (such as video, audio, and input and output devices) to enable interactivity with a user. Although the Devices and Printers feature is used to manage printers and other peripherals in Windows 7, Device Manager is the main tool for managing other devices (such as internal components, pointing devices, and so on).

Today's computers have several external devices that you can connect and use. In this section, you'll learn about installing and connecting video, audio, and infrared input devices as well as how to update drivers and uninstall devices.

Understanding Video, Audio, and Input Devices

CERTIFICATION READY
What type of video devices does Windows 7 support?
5.4

The main ***video device*** on a computer is the video adapter or card. This is an internal circuit board that's either in the form of a physical card inserted into a slot on the motherboard or is manufactured as part of the motherboard. Other types of video devices include webcams, video capture cards, and TV tuners, to name a few.

CERTIFICATION READY
What type of audio devices does Windows 7 support?
5.4

The main ***audio device*** in a computer is a sound card. Like a video card or adapter, it is either in the form of a circuit board that's inserted into a motherboard slot or hard-wired into the motherboard. Additional audio devices include microphones, headsets, and speakers. Headsets are always external devices, but microphones and speakers can be either internal or external.

CERTIFICATION READY
What type of infrared input devices does Windows 7 support?
5.4

Input devices are items such as keyboards, mice, trackballs, touchpads, digital pens, and joysticks (for gaming). On desktop computers, input devices are almost always external devices that plug into different ports on the computer. On a laptop computer, keyboards and touchpads are built in, although you can connect external input devices as well.

Many external devices, such as headsets and input devices, connect to a computer using wireless technology. A wireless keyboard or mouse, for example, comes with a small Bluetooth receiver that you plug into a USB port on the computer. The mouse contains a

Bluetooth transmitter that communicates with the receiver. As you move the mouse around, it transmits signals using Bluetooth radio signals rather than a wire. If your computer already has Bluetooth technology built in, you may be able to set up Bluetooth to communicate directly with the external Bluetooth device without the need for the USB receiver.

Many wireless mice use ***infrared technology*** and are referred to as optical mice. These mice have an infrared light-emitting diode (LED) inside the mouse that detects the surface over which it is moved. This technology lets you use the mouse on a wider variety of surfaces compared to legacy trackball mice that required a mouse pad to operate.

Understanding Plug-and-Play Technology

Nearly all modern devices that you attach to a computer port are automatically detected by the operating system. This is part of ***plug-and-play (PnP) technology***. As long as a PnP device is plugged into your computer and powered on (if the device requires power, like a printer), Windows detects the device and automatically installs the drivers.

CERTIFICATION READY
Do you need to install drivers for plug-and-play devices?
5.1

The first time you connect a device, you should see a bubble message on the status bar that states *Installing device driver software.* When it installs the device driver successfully, you'll see *Your device is ready to use.* The device has now been added to Device Manager. You can unplug the device and plug it in again, but the device driver installs only one time.

Understanding Device Manager

CERTIFICATION READY
What is the purpose of Device Manager?
5.4

You can manage most devices in the snap-in called ***Device Manager***. Device Manager displays a list of all devices currently installed on the computer and their status. Not just anyone can make changes in Device Manager—you must be an administrator or have administrative credentials to offer when the UAC prompts for them.

EXPLORE DEVICE MANAGER

GET READY. To explore Device Manager, perform the following steps:

1. Click **Start**, type **device man** in the **Search programs and files** search box, and then select **Device Manager** from the resulting list. (Alternately, click the **Start** button, right-click **Computer**, click **Manage**, and then lick the **Device Manager** node in the left pane.) Provide an administrative password or confirm to continue. The Device Manager page is shown in Figure 5-40.
2. The top line displays the name of the computer. Each of the nodes beneath are types of devices, such as battery, disk drive(s), display adapter, and so on. Within each device type are the various devices that are installed. To view the devices, expand the device type node (click the clear, right-facing triangle next to a node).

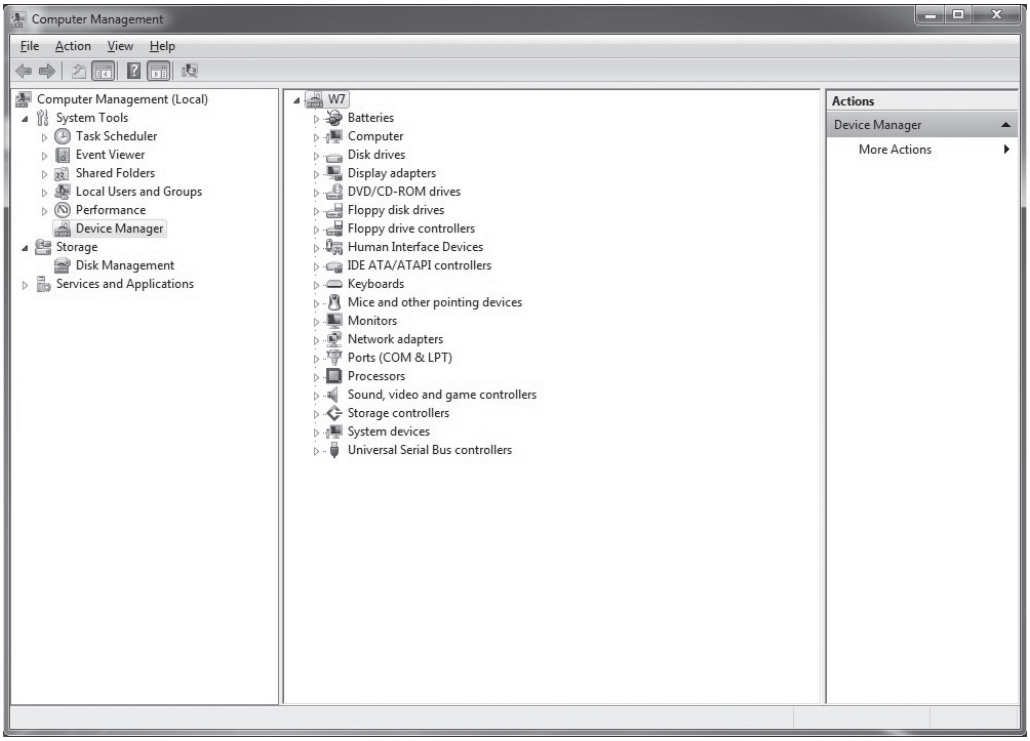
TAKE NOTE*

If there is a problem with a device, you will see a node expanded and a device listed beneath it that contains either a yellow yield sign (warning there is something wrong with the device) or a red circle with a white X to show that a device is not working at all.

3. To refresh Device Manager, click the **Scan for hardware changes** icon on the toolbar. Device Manager scans the computer looking for new devices to install or to remove devices that have been uninstalled but still display in Device Manager.

Figure 5-40

The Device Manager page



Let's look at an example of a newly added device. A Sennheiser headset was plugged into a computer named W7. The operating system detected the device and used PnP technology to automatically install the appropriate device driver. The device is ready to use. That means the headset is now listed in Device Manager, in the Sound, video and game controllers node. If you right-click the device (Sennheiser USB Headset) and select Properties, the options on the shortcut menu are as follows:

- **Update Driver Software:** This option enables you to instruct Windows to search the computer and Internet for an updated driver, or to walk through manual installation of an updated driver you have on CD or downloaded from the manufacturer's Web site.
- **Disable:** This option disables access to the device but leaves the driver installed.
- **Uninstall:** This option disables access to the device and removes the device driver.
- **Scan for hardware changes:** This option scans the computer, looking for new devices to display or missing devices to remove from Device Manager.

The last option is Properties. Clicking this option displays the Properties dialog box for the device. For example, Figure 5-41 displays the properties of the Sennheiser USB headset that was just added.

The Properties dialog box features three tabs:

- **General:** This tab displays the device type, manufacturer, and the device status. You should see *This device is working properly.* If the device status indicates a problem, the message typically provides some information as to the nature of the problem and how to resolve it.
- **Driver:** This tab displays the source of the driver (Microsoft or the manufacturer), the driver date, the driver version, and the digital signer. (Windows 7 64-bit versions require that all drivers are signed or they will not be installed.) See Figure 5-42.

Figure 5-41

The properties of a newly added device

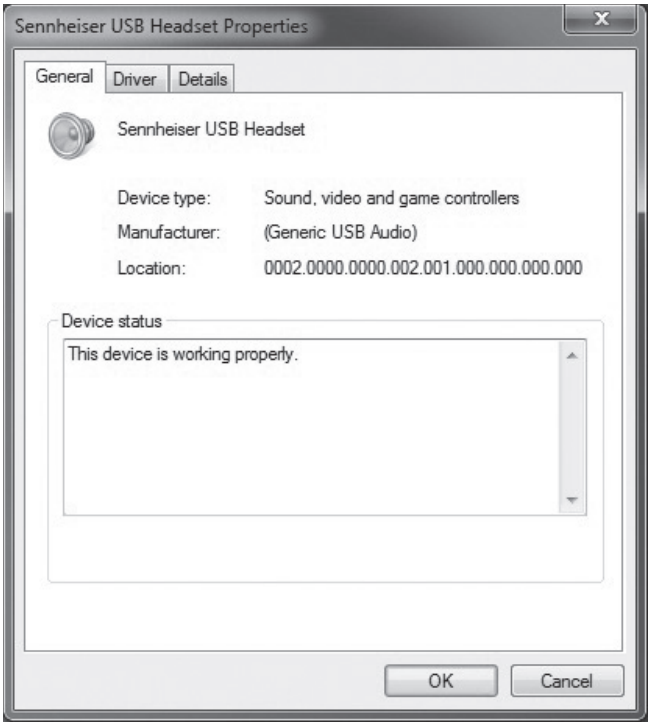


Figure 5-42

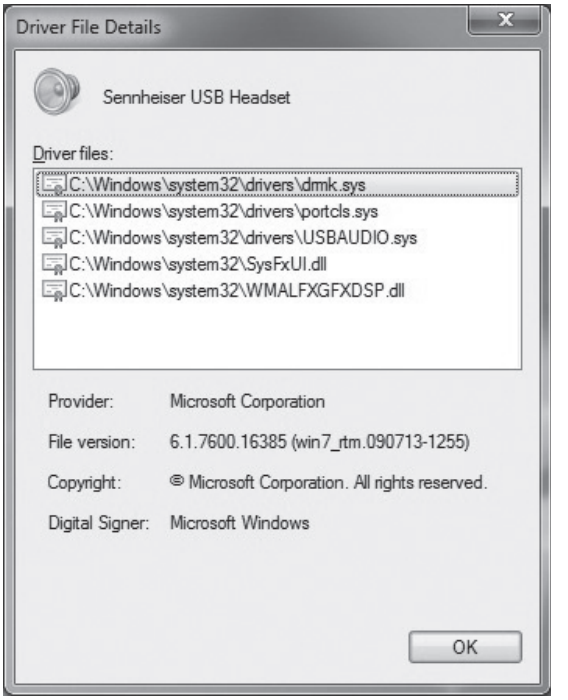
The Driver tab

The Driver tab includes five buttons: Driver Details, Update Driver, Roll Back Driver, Disable, and Uninstall. Clicking each button results in the following:

- **Driver Details:** Shows the actual files installed by the driver and their paths (see Figure 5-43). Clicking each file displays the details of that file. For example, selecting

Figure 5-43

The Driver File Details dialog box



C:\Windows\system32\drivers\dmk.sys shows a file version of 6.1.7600.16385 (win7_rtm.090713-1255). This information is helpful during troubleshooting. Not only can a user tell someone who is helping to troubleshoot a device driver issue the version of the driver, but the user can also state the exact version of the files inside the driver.

- **Update Driver:** Opens the Update Driver Software dialog box where you can search automatically for updated driver software or browse the computer for driver software. You can update a driver from a CD or DVD, or locate a driver you downloaded from a manufacturer's Web site.
- **Roll Back Driver:** Allows you to roll back to a previous version of a driver. If this is the first driver you have installed for a device, this button will be grayed out and unselectable because there are no previous drivers to roll back to.
- **Disable:** Disables the device.
- **Uninstall:** Uninstalls the device driver.

- **Details:** Shown in Figure 5-44, this tab displays many properties of a device. Open the Device description drop-down list to display a long list of property details. Whichever property you choose displays its value in the Value text box. Figure 5-45 shows some of the many properties you can choose.

For example, choosing the property hardware IDs lists two values that identify this hardware. You usually have multiple hardware IDs to try to match between the physical device and a driver. The hardware ID begins with the most specific and moves to the most generic. For example, Figure 5-46 displays USB\VID_1395&PID_0002&REV_0004&MI_00, which may indicate that this is a Sennheiser USB headset driver for Windows 7. The USB\VID_1395&PID_0002&MI_00 hardware ID is a Sennheiser USB headset for any operating system.

Figure 5-44

The Details tab

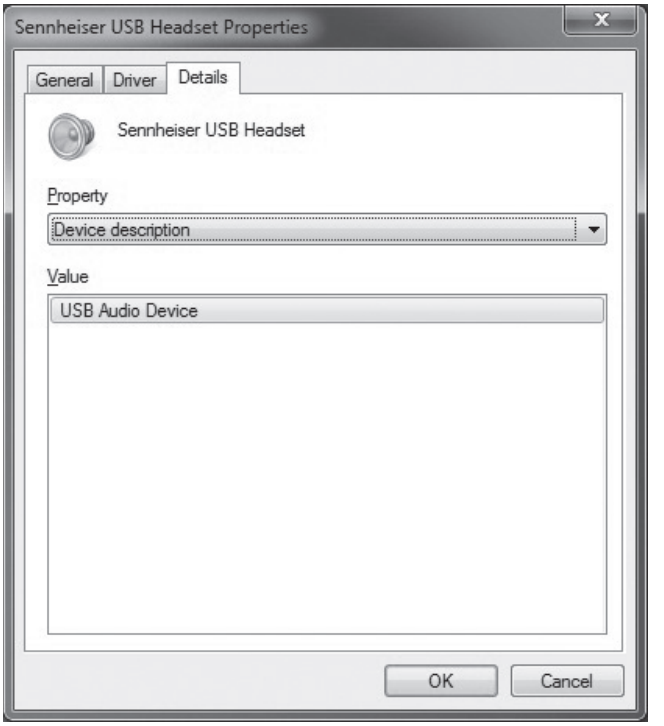
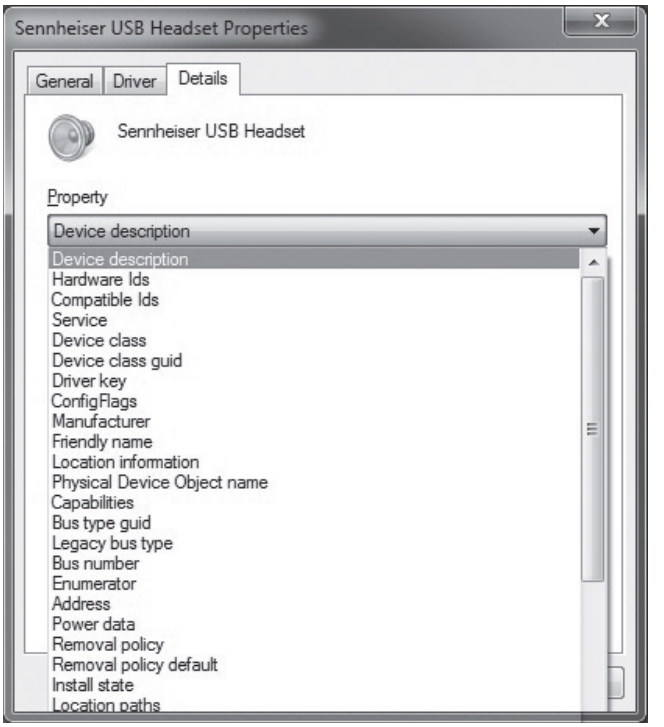


Figure 5-45

A list of properties

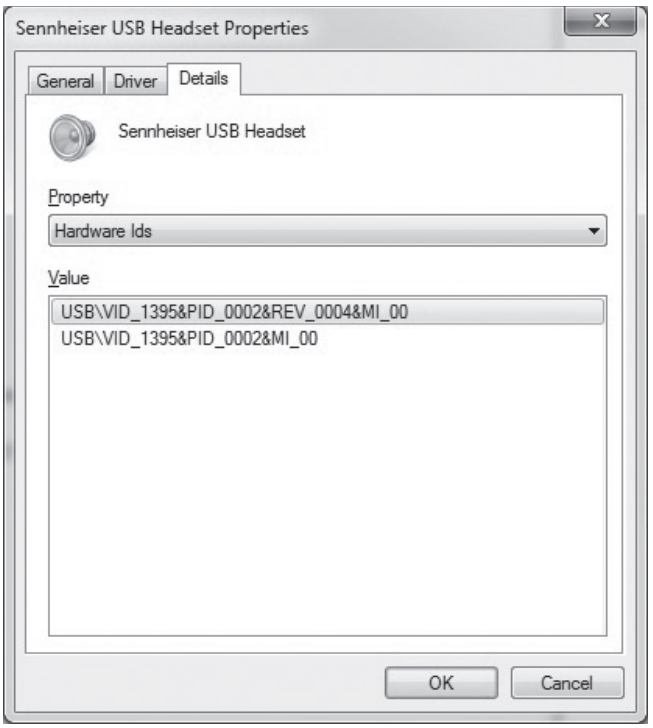


CERTIFICATION READY
How is third-party software installed for devices?
5.1

The hardware IDs and the compatible IDs are pieces of information in a driver that help the PnP device driver process identify the closest match between a physical device and the device driver. Regardless of which type of device you are installing or using—audio, video, printer, and so on—driver management is always the same.

Figure 5-46

Hardware IDs



INSTALL THIRD-PARTY SOFTWARE FOR A DEVICE

GET READY. To install third-party software for a device, perform the following steps:

1. Read the device manufacturer's instructions for installing device software. Connect the device before or after installation, as instructed.
2. Start the application's installation program.
   - If installing from a CD/DVD, insert the application's installation media into your computer's CD/DVD drive. The installer program should run automatically.
   - If installing an application you downloaded from the Web, or if the installer program doesn't start automatically when inserting a CD/DVD, open Windows Explorer, browse to the location of the application's installer program (such as **setup.exe**), and then double-click it.
3. Follow the prompts to install the application.
4. Restart Windows.
5. Test the device's functionality.

These steps are similar to installing any software application, as addressed in Lesson 4. During the installation, you might be prompted to accept a license agreement, select a location on your computer in which to install the software files, and perhaps enter a product ID or key.

UPDATE A THIRD-PARTY DEVICE DRIVER IN DEVICE MANAGER

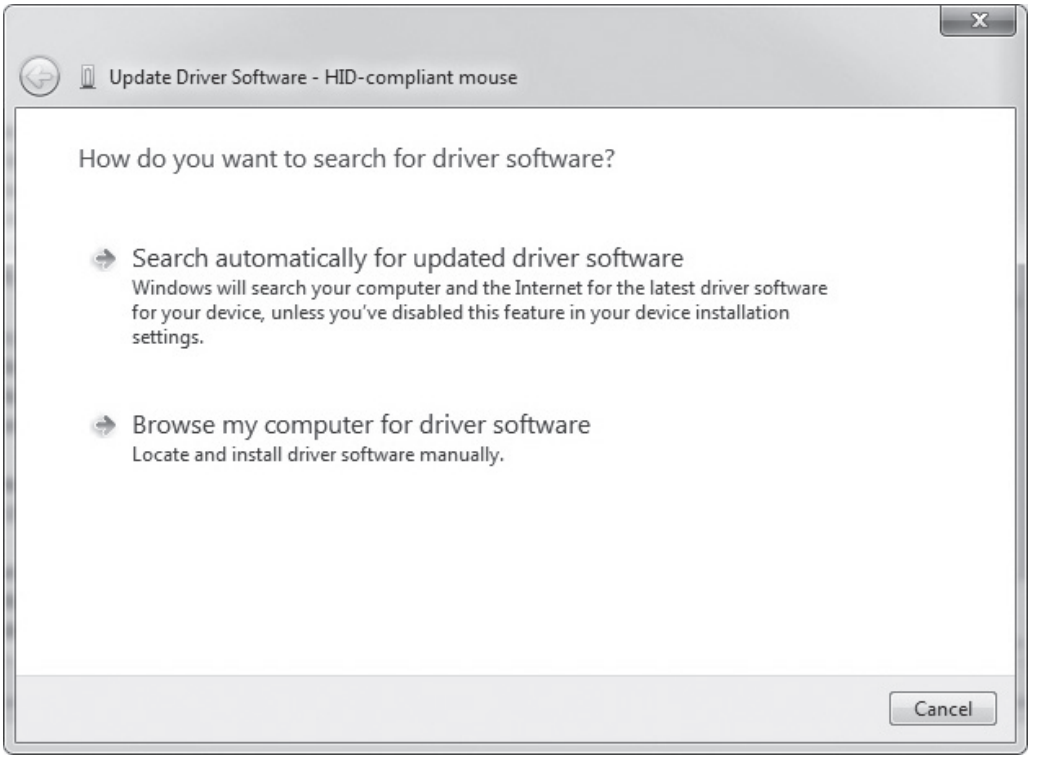
GET READY. To update a third-party device driver in Device Manager, perform the following steps:

1. Download the device's latest driver from the manufacturer's Web site and save it to your Downloads folder. For this exercise, you do not need to download the installation program, just the driver file.
2. Log on to the computer as the Administrator or with an account with administrative privileges.

3. Open Device Manager. (Click **Start**, type **device man** in the **Search programs and files** search box, and then select **Device Manager** from the resulting list.)
4. Expand the device type node of the device whose driver you want to update.
5. Right-click the device and select **Update Driver Software**.
6. In the Update Driver Software page that displays (see Figure 5-47), click **Browse my computer for driver software**.

Figure 5-47

The Update Driver Software page



7. On the next screen, click **Let me pick from a list of device drivers on my computer**.
8. On the resulting page, click **Have Disk**.
9. In the **Copy manufacturer's files from** drop-down list, select the drive where the software is located (or click **Browse** to navigate to the location).
10. Click any INF file that displays in the file list and then click **Open**. (INF files are the only files that Device Manager accepts for setting up drivers.)
11. In the Install From Disk dialog box, click **OK**.
12. Select the newly added hardware in the text box and then click **Next**.
13. If a warning message displays regarding compatibility with your hardware, click **Yes** to continue. The Windows 7 Update Driver Software Wizard installs the updated drivers for your hardware.
14. Follow any additional instructions to complete the driver installation.
15. You may be prompted to restart your computer after driver installation is complete.

Much like when you install printers, when you're trying to decide which driver to install (Microsoft versus device manufacturer), it's usually best to choose the manufacturer's driver because it often contains software in addition to the drivers and some graphical user interface (GUI) tools that can help you manage devices at a more granular level. However, third-party manufacturers are increasingly providing their drivers to Microsoft to be part of Windows Update. This way, whenever a device driver is needed, it can be installed from Windows Update.

There are some pesky drivers out there that don't install easily. Some tips for troublesome drivers are:

1. When you first connect the device, if the driver does not install automatically, disconnect the device and reconnect it. If the device requires power, ensure the power is turned on.
2. If you connect a new device but it doesn't appear in Device Manager, click the *Scan for hardware changes* icon on the toolbar in Device Manager.
3. If you allowed the Microsoft driver to be installed for a device and you are not getting the full functionality of the device, such as a duplex printer with no option for duplexing, install the driver from the manufacturer.

MORE INFORMATION

To learn more about Device Manager, visit http://windows.microsoft.com/en-US/windows7/products/features/device-management

SKILL SUMMARY

IN THIS LESSON, YOU LEARNED TO:

- The two primary types of disks are basic and dynamic.
- The tool that allows you to manage drives, disks, and partitions is Disk Management, found in the Computer Management snap-in.
- The two types of partitions styles are master boot record (MBR) and GUID partition table.
- The four main types of volumes are simple, spanned, striped, and mirrored, and you can easily distinguish them in Disk Management based on color coding.
- Windows 7 supports several types of storage: USB, IEEE 1394, network storage, and iSCSI.
- Windows Live SkyDrive, OneNote to SkyDrive, and Windows Live Mesh are cloud storage and services available to Windows users.
- Printing devices can be local or networked, or even available over the Internet. You can perform most printer support from the Devices and Printers applet. A print queue is a "holding area" in memory that holds prints jobs until the printer is finished printing the entire document.
- Device Manager helps you manage system devices such as audio, video, processors, and many more. Using Device Manager, you can add new devices, manage the drivers, determine when to use a Microsoft driver versus the manufacturer's driver, and get details on every file the driver installs.
- When you connect a Plug-and-Play (PnP) device to a computer, Windows detects the device and automatically installs the drivers.
- The main tool for managing non-printing devices in Windows 7 is Device Manager.

Knowledge Assessment

Fill in the Blank

Complete the following sentences by writing the correct word or words in the blanks provided.

1. There are two types of disks that are recognized by Windows 7: _____ and _____.
2. When creating spanned, striped, or mirrored volumes, you must allow for a _____ disk.

3. Spanned volumes are also referred to as _____ because the space on the first disk must be filled before data will be stored on the second and subsequent disks.
4. Spanned and _____ volumes must contain at least 2 disks and may contain up to 32.
5. _____ volume may only contain two disks.
6. When viewing your disks in the _____ snap-in you can easily tell the different types of volumes based on the color of the stripe over the volume.
7. The _____ storage device type is used to transfer data over local area networks (LANs), wide area networks (WANs), and even the Internet.
8. From within a Windows _____ you can pause printing, cancel all documents, and resume, or restart a document.
9. You can determine the version of files that a device driver installs and their complete paths by using _____.
10. _____ is a part of the Windows Live Essentials suite and enables you to keep data synchronized between computers and some mobile devices.

Multiple Choice

Circle the letter that corresponds to the best answer.

1. Which of the following can you create on a dynamic drive? (Choose all that apply.)
   a. Striped partition
   b. Striped volume
   c. Simple volume
   d. Spanned volume
   e. Mirrored partitions
   f. Striped partitions
2. Which Microsoft cloud storage solution requires software to be installed on the client computer?
   a. Windows Live SkyDrive
   b. Windows Live Mesh
   c. OneNote to SkyDrive
   d. Hotmail
3. After creating a document on Windows Live SkyDrive, which of the following is the easiest way to let someone know a new document is available?
   a. Call them on the phone and tell them, leave a message if not there
   b. Send them a document with the link embedded
   c. Share the document or folder
   d. Sync your computer with their computer
4. Which of the following is a feature that Windows Live Mesh offers that Windows SkyDrive does not?
   a. The ability to sign in using your Live Windows Logon ID
   b. 200 GB of free space
   c. Remote control of another machine
   d. The ability to share folders and documents with others
5. Which of the following is *not* a quick-start icon in Windows Live SkyDrive?
   a. Word
   b. Excel
   c. Outloook
   d. OneNote

6. Which of the following is used to quickly determine if a device had a bad device driver?
   a. Disk Manager
   b. Device Manager
   c. Driver Manager
   d. Control Panel

7. Which of the following can you synchronize using Windows Live Mesh? (Choose all that apply.)
   a. Folders on different computers
   b. Files on cell phones
   c. Internet Explorer favorites
   d. Microsoft Office settings

8. Which of the following requires its own power connector?
   a. eSATA
   b. USB
   c. FireWire
   d. USB 2.0

9. Which of the following stores an exact copy of data from the first member of the volume to the second member?
   a. Simple
   b. Spanned
   c. Striped
   d. Mirrored

10. Which of the following tasks can be completed with Device Manager?
    a. Update a driver's software
    b. Disable a driver
    c. Uninstall a driver
    d. Change a device's hardware ID
    e. Scan for hardware changes

True / False

Circle T if the statement is true or F if the statement is false.

T | F 1. Windows Live Mesh allows you to remote control machines that do not have the Windows Live Mesh software installed.

T | F 2. After you have created volumes and users have stored data on those volumes, you can easily change your partition style from MBR to GPT and back again with no difficulties.

T | F 3. When you add a new disk to a computer and open the Disk Management utility, you are automatically prompted to initialize the disk.

T | F 4. A GPT partition style is used for larger hard drives of up to 9.4 zeta bytes.

T | F 5. When creating mirrored volumes, you can use more disk space from one disk than the other.

■ Competency Assessment

Scenario 5-1: Ensuring Availability

Sheila, a programmer in your company, is developing an application for an important client. Her computer runs Windows 7, and she has a second disk installed that is currently not being used. What are some things you can do to ensure that her system is highly available?

Scenario 5-2: Troubleshooting a Printer Driver

Axel runs the warehouse for Mighty Bubbles Beer Distributor. He called you to report that the new wireless laser jet printer he recently purchased does not work. He connected it to the USB port on his computer running Windows 7 Professional and turned on the printer, but the printer does not appear in the Devices and Printers window. How should you advise Axel to help troubleshoot the problem?

■ Proficiency Assessment

Scenario 5-3: Providing Redundancy on a Client Computer

You provide support for a commercial bioengineering lab. Mizuki is a chemist at the lab, and she recently inherited a computer from the IT department that has two large hard disks and runs Windows 7 Ultimate. One hard disk provides ample disk space for her programs and data files, but she would like to use the other disk for redundancy to better protect her system and files. What should you do to provide the redundancy on her client computer?

Scenario 5-4: Using Cloud Services

The sales and marketing department at Fat Tire Bikes consists of two salespeople, a graphic designer, a copywriter, and a layout person.

Tonya and Aaron are the salespeople. Tonya is responsible for the western United States and Aaron covers the eastern United States. They tend to use the same files for all sales presentations, client follow-ups, and so on. When one modifies a template, it's important that the other gets the updated file as soon as possible.

The marketing employees share several Word documents and PowerPoint presentations, in addition to a large folder of graphical images. It's important for them to have shared access to a Marketing folder that contains the shared files.

What should you do to help the sales and marketing employees work more efficiently?